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General Article

LOW TEMPERATURE BLOOD MEALS AS A SOURCE OF ESSENTIAL AMINO-ACIDS FOR NUTRITIVE PURPOSES*

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INTRODUCTION

I should like, at the outset, to express my appreciation of the privilege which is mine to-night of addressing what I suppose is the largest, even though (as the President pointed out in his address a month ago) it may not be the oldest, Division of the N.V.M.A. Further, before beginning on the detail of my subject, I wish to draw attention to an aspect of veterinary science which does not perhaps loom so large as I think it should do. The practitioner, and perhaps especially the country practitioner, is losing a proportion of the work which he has hitherto been accustomed to carry out. There are various reasons for this, but I think that we must look to what one can only call modern scientific progress for the fundamental reasons which have brought it about. I need not go into details: everyone is already acutely aware of them. Quite frankly, I do not think that any amount of protest which may be raised can do more than temporarily delay the extension of centralised control over more and more of those diseased conditions of livestock which have hitherto been dealt with privately. With the excision from his practice of such things as the eradication of tuberculosis from dairy herds, the maintenance of tubercle-free stocks, work under the various Diseases of Animals Acts, and perhaps the control of Johne's disease, contagious abortion and mastitis, the practitioner will be compelled to look for other means of justifying his existence and other sources of revenue.

Already considerable attention has been paid to such aspects of work as poultry husbandry and disease, and the diseases of fur-bearing animals; while most practitioners can no longer afford to neglect or decline to attend dogs and cats. There is another aspect which I feel sure merits very serious consideration by the man in a dwindling practice: the study of nutritive requirements, balanced rations, and all that is contained within the term "modern nutrition." Some farmers may require a certain amount of education before they can be persuaded that it is worth paying for the advice and supervision which a veterinarian can provide and which may and will be instrumental in saving them money and in turning out better products from their livestock, but that will follow, even in spite of the free advice that may be given by the agricultural Press. I do not wish to develop this idea further: rather would I leave the thought with you. It may not appeal to everyone, but I sincerely believe it is worthy of careful consideration.

THE NUTRITIVE VALUE OF PROTEINS—THE IMPORTANCE OF THE CONSTITUENT AMINO-ACIDS

In years gone by, and I think I am right in saying to some extent even at the present day, there has been a tendency to consider that if the total amount of digestible protein in a ration was more or less correct, the composition of the protein itself and its constituent amino-acids did not really matter very greatly. In a general way, it has been known for some time by everyone, for example, that the protein of maize—*zein*—was not so satisfactory as the protein of oats—*glutelin*—for feeding to horses doing sustained hard work, and that the green leaf proteins in, say, lucerne, cabbages, or growing grass, were better for milk production than the *hordein* of barley.

Similarly, much has been written concerning what are called proteins of "high biologic" value and those of "low biologic" value. For the sake of any who may not have had opportunity to read of developments during the last 15 years or so, I may be allowed to summarise briefly some of the important facts relating to proteins of high biological value. In the first place, it has long been known that if an animal is fed on a diet containing adequate carbohydrates and fats along with protein in the form of pure gelatine, it will not survive. There are certain constituents of proteins (called *essential amino-acids*, in contra-distinction to non-essential amino-acids), which, in the form of crystalline salts, can be added to an otherwise adequate ration, and will enable the

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animal not only to survive, but to grow, reproduce and remain healthy. It is to these essential proteins that I would direct your attention. The most important are: *Tryptophane*, *Cystine*, *Lysine*, *Arginine* and *Histidine*, and to these may be added *Tyrosine*—though there is considerable doubt as to whether tyrosine and arginine are in quite the same category since Scull and Rose (1930) and St. Julian and Rose (1932) showed that when rats were fed upon known inadequate amounts of arginine, two or three times those amounts could be recovered in their tissues later, indicating that considerable amounts had been synthesised from other amino-acids. The question of tyrosine similarly is not yet settled. It is somewhat difficult to assign to each a specific function in body metabolism, but it is known that tryptophane and tyrosine are essential to life. Gelatine, in pure form, contains neither, nor has it any cystine. Death rapidly occurs if they are omitted from the diet. Further, tyrosine is closely related to adrenaline from the medulla of the adrenals, and to thyroxine from the thyroids. Now tyrosine and tryptophane cannot be synthesised; they must be supplied in the diet ready made. Certain plants are relatively rich in them: others contain very little. The function of lysine is peculiar. It is essential for growth and for milk-production in particular. If lysine-free proteins are fed to young rats they appear to remain healthy but fail to grow up. This condition of perpetual youth, attractive though it may be to us in a modern world, does not commend itself when it is exhibited in our young livestock! Cystine, the most important of the sulphur-containing amino-acids, can, it seems, be synthesised to some extent by bacterial action in the rumen and possibly large intestine, from the activity of micro-organisms, but a correct ration should contain definite amounts of it. Among other functions, it is required during cell proliferation and growth, probably by all tissues, and it enters largely into the process of keratinisation in the formation of horn, hoofs, fur, hair and wool. The exact functions of arginine and histidine are more difficult to define, but, in passing, it may be noted that the latter is intimately concerned in the secretion of gastric juice. When the normal level of histidine in the blood stream falls, a release of pepsin and hydrochloric acid takes place—a function of which use is now being made in the treatment of gastric ulcer, or rather the symptoms associated with this condition in man. (Bauke, 1935; Eads, 1935; and Smith, 1935).

The next point to which I would draw your attention is that, apart from milk, there are few animal foods which are normally fed which contain adequate supplies of each of these essential amino-acids. As examples of the variation in the amino-acid content of various proteins, the casein of milk contains little cystine, while lactalbumin (another milk protein) contains a high percentage. Oats contain only 0·7 per cent. of total nitrogen in the form of cystine, while peas contain 1·55 per cent. (Morris and Wright, 1933); similarly, barley only contains 2·2 per cent. of its N_2 as lysine, while beans contain 7·45 per cent.; decorticated earthnut cake contains 5·2 per cent. of its N_2 as tryptophane, while wheat has only 0·6 per cent. Such instances could be multiplied many times. Our knowledge on all details of the amino-acid content of proteins is not yet complete, although much more is known about them since the Van Slyke method of analysis was applied to determine the amino-acid content of many of the foods commonly used for feeding to animals. It is worth while emphasising in Jordan Lloyd's (1932) words that "after the chemist has made a full chemical analysis of any protein and has summed up the evidence as to its probable biological value, feeding tests remain the only final criterion." What actually happens in practice is that an animal which is provided with an adequate variety of foods can be reasonably sure of obtaining an adequate supply of one amino-acid from this foodstuff and of another from that and, *provided adequate variety is given*, need suffer no risk of a deficiency of any one.

Speaking on an allied subject specifically applied to human nutrition, Sir Frederick Gowland Hopkins has expressed an opinion which we would do well to apply to much of the ordinary farm livestock in this country. He said:—

> "The mere survival of a community is too often taken as a proof that the nutrition of its constituent individuals is adequate; the community, while managing to survive, may yet be functioning at levels far below those possible to its innate capacities."

I should like to suggest that we might paraphrase this to read that "the mere rearing and feeding of stock by a farmer is no proof that there could be no further improvement made in the quality of his finished product." It does not follow that because his cows average 1,000 gallons of milk, they may not be potentially and genetically capable of yielding 1,100 gallons. There is a difference between what is adequate and what is ideal or optimum.

With a view to suggesting a means whereby something may be done towards giving practical effect to the above fundamental aspects of protein feeding, I would like to draw your attention to the use of some of the more recently developed feeding blood meals. Ordinary dried blood, which is prepared by many abattoir authorities as a by-product, falls more cor-

rectly into the category of a manure, extremely useful for fertilising purposes but not suitable for feeding. In the process of drying there are two stages at which damage to the chemical constitution of the contained amino-acids occurs. The first is rapid heating at the beginning of the drying process, and the second is failure to adjust the end-temperatures so as to bear a direct relationship to the moisture content of the nearly-dry blood. Chemical disintegration occurs at both stages and in the latter a greater or lesser destruction of colour accompanied by charring results. For a rough guide, the colour and degree of charring are fair indications, in any given sample, of its likely value.

Blood meal or fibrinogen meal which has been carefully prepared and which has given good results in feeding trials, has a composition of the following type, compared with ordinary dried blood:—

	Moisture.	Protein.	Total Nitrogen.	Lysine.	Tryptophane.	Cystine.	Arginine and Histidine.
				Expressed as percentage of total Nitrogen.			
Blood Meal for feeding ...	8·0%	78·4%	12·75%	11·04	6·51	2·65	17·91
Dried Blood ...	14·0%	68·15%	Variable up to 10·37% as maximum.	8·73	3·9	0·69	17·7

It should be noted that with the existing almost infinite variation in the methods of producing dried bloods by different manufacturing companies and abattoir authorities, there is a consequent variation in the composition of the products. Many samples fall far below that given above in their amino-acid contents, and are, of course, useless for feeding purposes.

The reasons are mainly technical and have to do with the high temperatures necessary to ensure that any spores from pathogenic organisms are certainly killed.

One of the best-class blood meals, called "Fibrinogen Meal,"* uses as its sole source of supply the blood of healthy first-quality hill-lambs of the Blackface and Cheviot breeds and crosses from these, which are killed in Scotland at ages between about four-and-a-half and perhaps 15 or 18 months specifically for the London market. The blood from these young healthy sheep is collected at the large killing centres in milk-cans and taken by lorry to the factory. Here it is submitted to a special low-temperature method of drying which preserves the majority of the essential amino-acids present in the original blood. The possibility of the presence of pathogenic organisms in the finished product is guarded against by an initial boiling and subsequent pasteurising and drying at a temperature of not more than 70°C.

I mention these points since they indicate that the source of the blood is a healthy one and probably from as nearly a disease-free class of livestock as it is possible to get. Moreover, its initial composition is more uniform than where blood of animals of different species is mixed together.

From the above table it will be seen that in specially prepared blood meal there is available a source of supply of lysine, tryptophane and cystine (leaving out of consideration arginine, histidine and tyrosine, which are generally available from other sources), which can be utilised to make good possible deficiencies resulting from the exclusive use of foodstuffs which may be deficient in one or other.

If one takes many typical rations used for feeding to dairy cows for milk production and works out amino-acid contents from published analyses (and here I have used tables from various sources—but especially Allen's Commercial Organic Analysis, Vol. IX, 1932, together with those given by Morris and Wright, 1933, 1935)—one finds a common deficiency of lysine especially.

I might take the following ration recommended by one of the leading agricultural papers in its year book, to illustrate the point.

Crushed Oats - 2 parts
Ground Barley 1 part
Soya Bean Meal 1 „
} To be fed at the rate of 3½ lb. per gallon of milk produced.

The average lysine contents in grammes are as follows:—

	lbs. fed per gallon.	Containing grms. lysine.
Crushed Oats ...	1·75	2·95
Ground Barley ...	0·875	1·64
Soya Bean Meal ...	0·875	9·11
Totals ...	3·5	13·7

It is very difficult to give an accurate indication of what are the lysine requirements per gallon of milk secreted, but the amount of lysine in milk itself is given as 8·3 per cent. of the total N_2. As a provisional figure, an intake

* Prepared by Messrs. Dunlop, Bank Street, Dumfries.

of about 15·0 to 17·5 grammes per gallon of milk secreted would seem to provide enough lysine for body requirements and for the secretion of milk.

It is impossible in a short paper to go into all details, but by employing a formula based upon the inter-relationship between intake of N_2 in food, and the output of N_2 in milk, fæces, and urine, Morris and Wright (1933, 1935) have suggested relative biological values of some common foodstuffs for milk production as follows: fibrinogen meal, 73; pea meal, 64; bean meal, 59; decorticated earthnut cake *plus* flaked maize, 52; decorticated earthnut cake alone, 50; and linseed cake, 46.

The use of foods containing high proportions of essential amino-acids results in a very important practical consideration where both milk production and maintenance are concerned. This applies equally to the feeding of all farm livestock. The ordinarily accepted standard requirements per 1,000 lb. live weight for a cow are 6·0 lb. of starch equivalent and 0·6 lb. of protein equivalent daily for maintenance, and 2·5 lb. S.E. and 0·6 P.E. for each gallon of milk produced. In practice, it has been found that these give fairly satisfactory results in most cases where mixed proteins are fed. When, however, the amino-acid content of the protein is considered, and balanced so that there shall be no deficiency, a P.E. of 0·45 lb. gives better results. It should be clearly understood, however, that this low P.E. is not recommended for a ration which is deficient in any of the essential amino-acids, and in particular lysine. Cows fed at this low level of ordinary proteins soon drop in milk yield.

The following results illustrate this better: six cows were divided into two groups to give similar stages of lactation in each. They were fed on the following control ration, which was the regular farm ration in a commercial herd, for 21 days:—

Bruised Oats	3	parts
Bean Meal	2	,,
Decorticated Earthnut Cake ...	2	,,
Flaked Maize	1	part
Compound Meal	1	,,

This amount fed was at the rate of 4 lb. per gallon and each 4 lb. of the ration contains 0·65 lb. P.E. and 2·275 lb. of S.E., giving an N-ratio of 1 : 3·5, which is actually too narrow.

The total amount of milk given by the three cows during the three weeks was 1,428 lb. (142·8 gallons).

The rations were then changed to the following for a second period of 21 days:—

Bruised Oats	6	parts
Flaked Maize	3	,,
Blood Fibrinogen	1	part

This was also fed at 4 lb. per gallon, the maintenance rations remaining unchanged.

It contains 0·56 lb. P.E. in each 4 lb. and 2·63 lb. of S.E., giving an N-ratio of 1 : 4·71 (probably the most satisfactory N.R. where proteins of the right quality are fed is 1 : 5·0).

The yield during the period was 1,627·5 lb. (= 162·75 gallons), an increase of 19·95 gallons, on a very much cheaper ration.

It is freely admitted that, by itself, this result is not conclusive, but it is chosen as being typical of many other results which do not lend themselves to analysis in an address.

In passing, it might be noted here that there is a very considerable risk in feeding a ration with too high a total protein content, especially to breeding animals. Cunningham and Hopkirk (1935) have reported that it is possible to feed male rats upon a diet which includes every known factor, accessory and otherwise, required for male potency, and by raising the protein content to high levels to induce sterility. They suggest that the sterility of bulls grazing on pastures with very high protein contents, which has been reported from New Zealand, may be due to the excess of protein. A similar cause has been suspected in this country in young bulls and rams being fed forcibly for show and sale purposes, on rations with very narrow nutritive ratios.

It is worth while considering whether some of the functional sterility in dairy cows may not be due to gonadic over-stimulation with amino-acids of the wrong kind, but evidence is lacking up to date.

Other Applications

I have intentionally referred in the above detail to the effect of feeding essential amino-acid-rich fibrinogen on milk production, because it is possible to obtain a direct measure of the effects produced in a very short space of time. There are, however, encouraging results to report in other directions.

(1) *Post-Weaning Check.*—It is within the knowledge of those who have close experience of rearing livestock—especially calves, foals and lambs—that following weaning, or the stopping of supplies of milk, it is very common to find that young animals suffer a more or less severe check to body growth. This, in calves, may last for as long as four to six weeks, and for at least the same period in foals. Milk is a complete food, containing in most species* the adequate supplies of minerals and amino-acids required by the young of that species. The change, often made quite suddenly, to a wholly or mainly cereal diet, results in a severe check to body growth and progress. Where baby beeves, and young fat lambs especially, are the aim of producers, this check represents cumulatively a serious economic loss unless some-

*This does not apply to the modern highly-productive sow, whose milk may readily be deficient in iron.

what extravagant rations are given to counteract it. In observations carried out in Scotland during the past three years, it has been shown that where lambs and calves have been put on to a ration supplemented by fibrinogen meal, this check period can be very much shortened. Curves of body weight, though still showing the "post-weaning check," resume the normal trend within two to three weeks.

In foals, figures are more difficult to obtain, but the same general tendency is shown. In my opinion, it is a policy of sound dietetics to advocate the use of a ration which bears a close relationship to milk immediately the natural supply is cut off by weaning. On general grounds, milk is a body fluid derived from blood, and the animal owner can usually readily appreciate the desirability of endeavouring to substitute it by something which will supply those essentials which milk contains. The figures available relate to lambs, and it may be that the fibrinogen meal used, prepared as it was from sheep's blood, more nearly approximates the exact requirements of lambs than it does those of other young animals, but results in calves and pigs are from an observational viewpoint similar.

(2) *Flushing in Ewes.*—Most flockmasters are already fully aware that it is possible to obtain a better lamb-crop if ewes at the time of service are on what has been called an "ascending metabolic gradient," than otherwise. Grant (1933, 1933-4) showed that the reason for this was that in the ewe there is a series of incomplete œstral manifestations at the end of the anœstral period. Each successive œstrus is stronger than that which preceded it, and what in the early part of the breeding season is a latent change, almost imperceptible except on examination of uterine smears and evidence of the presence of a recently ruptured Graäfian follicle in the ovary, becomes a normal œstrus accompanied by the physiological and psychological disturbances associated with typical heat and mating. After remaining at peak levels for from three to even six or seven occasions in the unmated ewe, œstrus becomes less and less pronounced and finally with the onset of diœstrus, disappears. The effect of flushing is to stimulate these early, latent or imperfect œstral periods into fully functional ones. During earlier ovulations (unaccompanied by œstrus) it is more common for two or more ova to be shed simultaneously than it is later, so that in consequence of "flushing" when fertilisation occurs early, there is a greater likelihood of twins or triplets resulting. Many different methods of inducing the "flush" in ewes are in vogue. The only common feature is the use of a food which has a high protein content—such as feeding on green tares, or rape; lucerne, grass or clover aftermaths; crushed oats; pea meal, kibbled beans, or even decorticated cotton or earthnut cakes, or mixtures of these. There has been no chance yet to determine which of these is superior, but probably each is satisfactory in different districts. In Edinburgh, where we had no opportunity to utilise green crops specially grown, we found that ewes could be "flushed" very satisfactorily by the use of an addition of 2 to 3 oz. per head per day of fibrinogen meal to the ordinary ration (oats, bran, hay chaff).

I am anxious to see fibrinogen meal used in self-contained dairy herds with a view to avoiding the "œstral lag" which so commonly occurs during the winter months in tied cows fed on a diet deficient in green or "living foods." In dairy herds where this meal has already been used in the ration—mainly for its milk-producing qualities—owners volunteer the information that cows came to the bull far more regularly than they did previously. Unfortunately I have no more detailed evidence than this in the meantime.

A point of interest in this connection is that in the circulating blood stream of a healthy animal there is, at all times, an adequate balanced supply of hormones. Some of these are relatively thermo-stable, and together with other substances, especially the iron contained in hæmoglobin, and various extractives, are present in low-temperature dried blood meals and may exert a direct stimulating or reinforcing action upon the physiological functioning of the reproductive organs. I am, however, mentioning this tentatively only meantime.

(3) *Iron-Deficiency Anæmia in Young Pigs.*—The use of fibrinogen meal, with an iron content of about 0·58 per cent., suggests itself as a ready means of preventing the anæmic condition of young sucking pigs which are deprived of adequate supplies from other sources, such as green foods. Admittedly, iron can be supplied in other and cheaper ways—such as in the form of crude iron oxide, or painting the sow's udder with a mixture of iron and copper sulphate solutions—but the iron in blood is organically combined. The exact significance of organic combination as distinct from inorganic chemical union in nutrition is not always easy to define, but it is agreed that most mineral elements are more readily assimilated from organic than from inorganic compounds. In this connection, the action of copper must be remembered; this acts as a catalyst, rendering iron more easily absorbed by the upper part of the alkaline small intestine and utilised in the hæmopoietic tissues, but not actively entering into the constitution of the blood stream other than in very minute quantities. It is, of course, for this reason largely that iron compounds in purified form are inferior (or useless) in correcting iron deficiencies when compared with crude

iron preparations which have small amounts of copper salts present as impurities.

As already pointed out, fibrinogen meals provide a useful addition to the rations of newly-weaned young animals to take the place of milk in part; in young pigs receiving it there is very little likelihood indeed of any trouble resulting from anæmia. None so far has been reported.

(4) *Convalescence from Red-Worm* (Trichostrongylus *sp.*) *Infestation.*—Everyone, whose work brings him into contact with foals, yearlings, etc., in a horse-breeding district, knows that after anthelmintic treatment there is usually a period, which may be prolonged, during which it is necessary to nurse a young horse very carefully indeed if permanent damage is to be minimised or avoided. It is also common knowledge that in severe cases, no matter what care is taken, or no matter how effective the treatment may be, it is impossible to restore an animal to normal health. The addition of fibrinogen meal to the rations has a marked effect in stimulating the blood-forming elements of the vascular system and it is well worth using in such cases as can be treated before severe structural alterations have taken place in blood vessels.

(5) *Other Indications.*—Various conditions associated with general debility, weakness during convalescence, etc., should logically be treated primarily by reinforcing the blood stream. Good results have been reported from using this meal as a tonic addition to the diet for bitches which have reared large litters of puppies and are thin or emaciated in consequence, for male dogs standing at stud, for poultry which have acquired the vice of feather-eating, when confined under intensive systems—though it should be noted that in birds which have acquired the *habit* of cannibalism (which becomes something analogous to a neurosis in more highly organised animals) nothing that can be done in the way of adjusting the diet or altering the protein intake can overcome the vice.

Probably I need not elaborate this aspect more. I am more interested in endeavouring to stimulate interest in a sadly neglected branch of our work—normal nutrition and general husbandry. I claim no originality for much of what I have included in this account. It was necessary to hang a story on a series of pegs and many of these pegs were driven by others. I should have liked to have been able to include a consideration of what I believe to be a more rational use of certain mineral supplements for pregnant and lactating females, and for young growing animals, but that itself is a very big subject and worthy of consideration separately. Knowledge of the rôle of minerals in nutrition is increasing at such a rate in modern days that new work becomes old almost as soon as it is published, and it is increasingly difficult for anyone to keep abreast of the times.

It is very interesting to note, in passing, that the lag between discovery and application is getting progressively shorter. The competition of modern chemical industry is such that the results of investigation no longer remain for years before being incorporated into practice. Even the proverbially massive inertia of our Government Departments is beginning to disappear and Acts and Orders follow each other with bewildering and almost indecent haste. The agricultural livestock owner, to be successful in these days, must possess intelligence and ability of no mean order; this, I submit, should stimulate us in the profession to pay more attention to subjects which in the past we have rather inclined to forget once the third professional examinations were over.

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Discussion

The discussion was opened by Professor G. H. Wooldridge, who said that Professor Miller's marvellous paper had left him almost breathless and he thought it was anything but fair play to expect anybody to discuss a paper of that kind at such short notice. Even if one had ample notice, however, he was not quite sure that one

could discuss such a paper adequately; as a matter of fact, he had been placed in possession of a copy only just as he was coming to that meeting. He was sure, therefore, that they would bear with him when he apologised, in the first instance, for dealing with so masterly a contribution in a more or less cursory manner.

He thought that Professor Miller was very definitely to be congratulated even if it were only because he had drawn their attention to what they had never even suspected until recent years. As he had said, one needed to arrange for balanced rations, considering the carbohydrate content, the fat, the indigestible or fibre content and albuminoids. If the food contained a certain proportion of these last they had not worried much about it, but Professor Miller had drawn their attention to the fact that there was a variety of these proteins which were of very considerable importance, and that although the food might contain a good percentage of total proteins it might nevertheless be very seriously deficient. In respect of the question of variety of proteins, he thought that the first thing one realised was that since the different food meals containing protein did not contain the same protein throughout, some foods were deficient in certain proteins and others contained an excess of those particular proteins. That confirmed the practical experience of many agriculturists and veterinary surgeons, who had long realised that a mixed ration was the thing to aim at, and that to give a concentrate made up of only one grain was likely to produce unsatisfactory results. Many agriculturists and practitioners had long shown that if they were to use four or five different concentrates and mix them together, they got better results than if they used one concentrate alone. That had been explained by the details furnished to them that evening by Professor Miller, who had shown that science had been able to bring forward evidence to support practical findings. He thought they would often find that to be the case. The advantage of knowing the detail was that those constituents of a mixed ration could be put together in a more economical way, and that thereby the ration would be more likely to produce the results aimed at.

He had been interested, too, in Professor Miller's observations on lysine, and he noticed that in the analysis the essayist gave in respect of barley, he pointed out how deficient it was in that constituent. He would like Professor Miller to explain why pigs fed on barley meal almost invariably throve so well when the ration was so deficient in protein like lysine.

What he (Professor Wooldridge) had said about "protein" alone as such not being sufficient was emphasised in the paper by the uselessness of gelatine. Just "protein" was not enough. It must include various definite amino-acids.

A very interesting reference was that to the possibility of producing sterility by a too-high protein ration. That was shown in the experiments carried out in rats and had been applied in the case of bulls. The agriculturist had known that if he gave too high a protein ration to the bull, there had been some depreciation in the stock-getting ability of the bull: we now had some scientific explanation of that. The same sort of thing applied, again, in respect of dairy cows. Farmers had often said to him that it was a curious thing that, when they went on improving their herd and had just got it to the highest degree of proficiency, as they thought, then the cows stopped breeding. It might be that that also was due to a too-high protein ration, or that the ration contained too much of particular types of protein.

It was very interesting, too, that Professor Miller recommended the use of that fibrinogen meal in weaners. If that time could be cut down materially in the case of the fattening of young lambs and young beeves it would be a great advantage to the farmer and indicated one of the ways the veterinary surgeon might take to assist the farmer.

The same thing applied to the reduction of the "œstral lag," especially when cows were still fat. In these days, when the farmer had got to make certain of an equal milk supply throughout the whole year, and had to keep his cows calving down regularly throughout the year, it was important that they should lose no opportunity of ensuring more regular fertility, more regular calving and a more constant milk supply.

Continuing, Professor Wooldridge observed that he was very interested in Professor Miller's treatment of animals in convalescence of different kinds, especially in that from the condition produced by the infestation of horses with red worms. If the administration of a particular protein, as indicated in fibrinogen meal, would assist in shortening that period of convalescence, it would be a godsend. That reminded him of an instance of how old practitioners, by sheer observation, were in advance of their time. He recalled that in his lecture notes he incorporated remarks as to the use of milk and beef-tea and other fibrin products in purpura hæmorrhagica of the horse. It seemed to him at the time that that was a first-class piece of empiricism, but in view of what Professor Miller had told them that evening, he felt that they could not do better than go back to some of the old methods of treatment of such affections as purpura hæmorrhagica and give milk and beef-tea—beef-tea provided by the slow, simmering process and not by boiling.

The reference that had been made to cannibalism suggested to him a possible means of controlling cannibalism in sows and brood bitches. One wondered whether such a liberal

supply of protein might enable them to satisfy the craving which resulted in the eating of the young by their dams. In this same way, too, the reference to the use of histidine in the treatment of dyspepsia and incipient gastric or duodenal ulcer, made one feel that it might be of wider practical application so far as the human subject was concerned: it might be also helpful in some of those cases of intestinal ulceration in various areas in animals.

Concerning the question of the lag or the delay between the discoveries of the scientific world and their application in the field, in modern times there had been a great and growing tendency towards a closer liaison between the research laboratories and the practitioner. That was all to the good, because those discoveries could only be tried out satisfactorily in the field and they would help them all in their general work.

In conclusion, Professor Wooldridge again expressed his indebtedness to Professor Miller for bringing that subject before them, adding that he was quite sure that all of them would be able to get a better grasp of the paper when they read it more leisurely in *The Veterinary Record.*

The Hon. Secretary (Mr. H. E. Bywater) said that he also would like to thank Professor Miller for his paper, but the essayist had got them rather "on the hop," because they had expected to hear something about mineral deficiency.

He was surprised that Professor Miller had suggested that veterinary surgeons were unaware that the lack of certain essential proteins was responsible for failure to maintain health, for they were taught at College that there was a justification for cannibalism in the fact that certain essential proteins were required for each animal and that these were available ready made in the animals of like species.

With regard to those proteins which the essayist had mentioned as being essential, in human dietetics it was now customary to divide proteins up into first-, second- and even third-class proteins, because it was a well-understood thing, in human dietetics, that such a division was necessary. Only a very small amount of essential or first-class protein was required for the maintenance of health in the adult animal—the great need for it was in the growing and the pregnant animal and, to a lesser extent, in the lactating animal. He was certain that there was an inter-relationship between protein and mineral and it was to that that he was inclined to attribute the gratifying results attained by feeding small quantities of pure white fish meal, which had in addition to protein a very high content of organic calcium and a smaller content of other minerals, including iodine. He was not so sure that blood meal was so very much superior to white fish meal, because the latter contained these mineral elements.

Professor Miller had mentioned that the sheep blood meal with which he was dealing was especially good for sheep, and he agreed with the essayist that there was some doubt whether one would get quite the same results when it was introduced into other animals.

He would like to deviate at that point and say, with regard to the fattening of pigs on barley meal, that everybody knew that if one put ten per cent. pure white fish meal in one's barley meal one would get much better results.

With regard to the minerals, soya bean meal contained a high percentage of protein, but was notoriously poor in minerals, and if a sow were fed with it, nothing like as good results would be obtained as if she were fed on pure white fish meal, in which the minerals were present in their natural organic form.

Concerning Professor Wooldridge's point about sows eating their young, it might interest him to know that that had been definitely prevented by feeding pure white fish meal in the sow's ration, as the sow's requirements in regard to protein and minerals were thereby met. Cows also had received great benefit from pure white fish meal, because generally if one fed some first-class protein to a cow she would wear out less quickly.

No one who had any experience of the average abattoir would wonder why it was necessary to have a new and more satisfactory method for the collection and manufacture of blood meal. The great point was the process practised for collecting the blood prior to the manufacture of the meal—which under the usual conditions was definitely teeming with organisms. With regard to the manufacture of blood meals, the lower the temperature that was used, the better, and the slower the process of drying (within limits) the better was the finished article—indeed, that applied to all meals.

The question of anæmia in young pigs was rather a complicated one. Could it definitely be cured by giving fibrinogen meal? Prevention and cure were often very different things. If one could encourage pigs to eat a little fish meal or indeed any food plus sulphate of iron, one would usually cure one's piglets of anæmia. Under normally healthy conditions the milk of the sow contained just enough iron to maintain the health of the offspring, and if the sow were turned out to grass while she was pregnant and whilst the piglets were sucking, the iron content of the milk would be maintained and iron deficiency would be avoided in the young pigs. Another means of preventing and curing iron deficiency in young pigs, used in conjunction with the other methods he had mentioned, was to throw clods of earth into the pigsty and let the sow and little pigs root about there.

With regard to the protein content of linseed cake, many feeders now thought that an increase in body weight was just as readily procurable from feeding flaked maize with bran. The only point was that flaked maize contained no first-class protein at all, but this was not so necessary for fattening.

Once an animal had grown it required very little first-class protein; moreover, excess of protein was harmful and would cause infertility in the breeding animal: if the animal were not pregnant, it would not do so well as if the protein were kept at a fairly low level.

Mr. J. W. McIntosh observed that he had very little to say, beyond joining with the other speakers in thanking Professor Miller for giving them that very excellent and instructive address. He thought he was right in saying that to most of them there that evening, the paper was beyond discussion. His own experience in feeding for the past 30 years had been confined to horses and he was a little disappointed that his friend Professor Miller had said nothing on that aspect of the subject. It might not be of the same importance to-day as it was some years back, but it was still important and it was to him very surprising that no serious attempt had been made by investigators—in this country at any rate—

to explore that wide field of economics—mainly, he thought, through failure to appreciate the full economic benefits to be derived.

He was not going to make any attempt to discuss some of the finer points mentioned by Professor Miller, but he would certainly read the paper over at a later date, when it appeared in print, with renewed interest and, he was sure, benefit. The subject was one of the very greatest importance and, he ventured to think, one that had been much neglected in the past. He hoped the younger members would realise the necessity of carrying with them into practice a thorough grasp of those details which had been so well explained to them that night.

He complimented Professor Miller on the very excellent work he had done, and was still doing, and he hoped and believed would continue to do for many years.

Major T. Hicks observed that, first of all, he must congratulate the essayist on his admirable paper, which he was sure was of great interest to them all, whether they were connected with the larger animals or with the smaller. The subject of the paper was one that entered into the realm of dietetics, and as all were somewhat puzzled therein he felt that they must all have learned something from what Professor Miller had put before them.

He was particularly interested in bloodstock, and he was wondering if Professor Miller would tell him the "dose" of fibrinogen; also, when would one start with a pregnant mare and when with a foal—after it was weaned or before? He would also like to ask if fibrinogen would be of any use in hæmorrhages? He had an instance eighteen months ago in which a "National" horse, having its head out over the half-door of the box, was struck by something—never had he seen a horse lose so much blood. It was at least twelve months before the horse was fit to gallop again, and he thought that perhaps if he had been able to incorporate some fibrinogen in the food that period might have been materially shortened.

With regard to anæmia in young pigs, he thought that sulphate of iron was quite an old agent in treatment; in fact, his father mixed 5ii $FeSO_4$ and 5ii $CuSO_4$ in a Winchester quart and gave one teaspoonful per sucking pig once daily. He thought that would be of value if followed by fibrinogen. Concerning anæmia, the result of worm infestation in horses, the old-fashioned treatment of allowing plenty of milk during convalescence had rather a bearing on the theories advanced by the essayist. He had a neighbouring practitioner who supplied further support to those ideas "from the field," in relation to dairy cows, in that not only did he inflate the udder of a milk-fever infected cow—after injecting potassium iodide—but used a cow that had just calved to furnish the patient with milk to drink. He did that before the new treatment came in and by that means he was certainly getting the calcium into the cow.

He desired to ask, in conclusion, would Professor Miller recommend the adminstration of bone meal as well as of fibrinogen—to foals, especially?

Brigadier-General Mosley, who was warmly welcomed by the President on behalf of the meeting, said that after some years of absence it was a great pleasure to him to come back to the Central Veterinary Society and find it still such a live concern. He felt that he had been very fortunate that night to have been able to come and listen to such an interesting paper as that given by Professor Miller, and he would like to take that opportunity of thanking and congratulating him.

He quite agreed with him when he said that work on food deficiency had been somewhat neglected in the past, but now it was being taken up more seriously, particularly in India. There had been several research workers, but it was quite right to say that their work had been limited owing to financial circumstances; nevertheless, it was hoped that shortly they would have a central international institute in connection with Muktesar in which that work would be thoroughly carried out—and there was great scope for such research work in India.

It was known that there was a food deficiency throughout the country and of course it varied greatly from province to province. In one branch of the Army the military dairy farms were introduced with the idea of supplying British troops and families with a plentiful supply of pure milk, and these had been of great value to the Army because they had, as had been proved by statistics, greatly reduced the amount of sickness amongst the troops. That department had only been going about thirty years, but tremendous strides had been made not only by improving the breeds of indigenous cattle but also by the importation of foreign cattle, while they attributed a great deal of their success to having an analytical chemist attached to their dairies.

At one time bone meal was given to all cattle but in substituting a green fodder, known as burseem, this was not necessary now, so it was said; one would like to make further investigation before accepting this, however, because, invariably, when the layman carried out experiments, he did so without proper controls.

Again, India was now, he supposed, one of the biggest horse-breeding centres of the world. The Punjab, which at one time was nothing but a sandy desert, had now by canalisation become a fertile plain, and this plain was divided up into sections, called squares, each square being about 25 acres, and was farmed by the ex-officers and non-commissioned officers of the Indian Army.

For each square the farmer must keep a brood mare, and there were in those areas 12,000 brood mares. Suitable yearlings were brought by the Remounts and kept in depôts until they were five years of age when they were issued to regiments as Remounts, so that those animals were under veterinary supervision all their lives there. There was a great opportunity for the investigation of food deficiencies and food requirements for young equine stock.

So far as he could give advice as to what the young stock should actually receive to produce so much bone, or increase of body weight, it was hypothetical. In all text books he had read the solution was "give as much as the animal can eat." He did not agree with this theory because the important factor was what the animal could digest.

It had been suggested that there should be a nutritional centre in this breeding area, but owing to financial stringency that had not been carried out; nevertheless there was a golden opportunity for research work, which was urgently required. They had found in those breeding areas that there was a high percentage of sterility in mares kept in high condition; they also found the same amongst the stallions, the reason being what Professor Miller had told them. They found that work overcame these disabilities to a certain extent.

He would like to ask Professor Miller whether

œstral lag was in any way a form of avitaminosis, because in some parts of India they found animals became very unthrifty, and it was suggested that this was due to a lack of vitamins in the food.

Mr. Nevill King commented that he found it difficult to reconcile two statements made by Professor Miller. One referred to excess of protein in the ration producing sterility both in the bull and in cows, while in the other he recommended the use of fibrinogen for a dog at stud. Was there any definite law that one could lay down as to what constituted excess; what was to be regarded as the limit in the use of concentrates? Further, could Professor Miller give them a reasonably balanced ration, containing fibrinogen, for a herd of dairy cows?

Mr. N. J. Scorgie said that he would like to give an instance of the use of fibrinogen in a herd of cattle. As many of them knew, breeders in the north brought a large number of cows from the Islands and these at first showed a temporary ancestrum; in two herds with which he was acquainted this was a very serious problem indeed. About three months ago they started feeding that blood fibrinogen to the animals which had not gone into œstrum after calving, and although it was far too early yet to say if the results were satisfactory, they were hoping that they would be. That was just one instance of the application of fibrinogen.

The President (Mr. J. F. Macdonald) said that before calling on Professor Miller to reply to the questions that had been raised, he would like to add his thanks to those of other members who had already spoken. It was indeed "an ill wind that blew nobody any good," and he thought that when Professor Miller came south, what the Scottish Metropolitan Division lost they had decidedly gained, and they hoped that Professor Miller would be with them for a long time and would give them many more papers while he was here. (Hear, hear.) He was not in a position to discuss the paper himself, but he would certainly give its author's fibrinogen a trial in equine convalescence after red-worm infestation.

The Reply

Professor Miller said that, in the first place, he would like very seriously to apologise both to the Society and to Professor Wooldridge for what was his (the speaker's) own fault—the misunderstanding which occurred in regard to sending a copy of the paper to the opener of the discussion—and he much appreciated the action of Professor Wooldridge in stepping into the breach. Professor Wooldridge's remarks, very kindly and ably made, tended, he thought, to show that in many cases science had not managed to do more than confirm some of the older ideas; but it should get due credit for having done that, because there were so many ideas, some of which were held very very firmly indeed by the older people, which were entirely erroneous, and if science had done nothing else, it had surely shown which was the wheat and which the chaff amongst those ideas.

To take the points more specifically as they arose, he would deal first with the argument that barley meal by itself was frequently sufficient to produce fat pigs. He thought that was the case with adult pigs, but, as Mr. Bywater had pointed out, much better results were obtained in both young and old when fish meal was added.

There were many practical points brought out by Professor Wooldridge—a most valuable amplification of his paper, for which he would like to thank him. There was always a danger in deciding a question on theoretical grounds only, for the theory might not apply in practice, but it had been proved that if specific amino-acids were fed instead of bulk protein a definite advantage was obtained.

With regard to cannibalism, he agreed it was a matter of fundamental importance; craving for extra protein was probably the initial cause. But there was also a psychological aspect of the matter which could not entirely be disregarded. Even when young gilts were fed on a perfectly balanced diet one individual here and there might be subject to some profound emotional disturbance and in spite of her complete protein ration she might begin to eat some of her young pigs. Once the habit became confirmed, it became a vice impossible to eradicate. The same remark applied to feather-plucking and cannibalism in poultry.

Concerning the references that had been made to work on histidine in gastric ulcer, a short list would be found at the end of the paper. The results were said to be sometimes so spectacular that they could hardly believe them, but most of the reports were of a preliminary nature.

The trend of Mr. Bywater's remarks, he thought, was that, in the first place, the best protein for any animal was the protein of the same species of animal, and then he went on to say that fish meal was the best for every animal. These two statements were hard to reconcile; according to the first part of his theory, fish meal ought to be fed to fishes only. (Laughter.) Good though they all admitted fish meal to be on nutritional grounds, it had the further advantage that it was marketed at a reasonable price and that the supplies were almost inexhaustible. He would like to suggest to Mr. Bywater also when he talked about first-, second-, third- and fourth-class proteins, that he was in danger of falling into a trap: he really meant amino-acids—it was really more correct to speak about essential or non-essential amino-acids.

With regard to the inter-relation of proteins and minerals, that raised an enormous subject; perhaps the best way to consider the matter was to draw an analogy from the machine in which a number of cog wheels were working together, if one cogwheel suffered breakage the whole machine would be thrown out of order. The same applied to feeding. It was immensely important that the *balance of* all the constituents of food should be preserved. He must, however, decline to be side-tracked into a discussion on minerals at that time of night: it was a subject which merited a full evening's discussion. [Professor Wooldridge: "In future, from Professor Miller." (Hear, hear.)]

Proceeding, Professor Miller said that concerning the prevention of that particular form of anæmia which was due to iron deficiency, he was afraid that in those cases where fibrinogen meal had been used there had been no opportunity to say whether its curative effect had been as marked as its preventive effect. He suggested that if Mr. Bywater had an opportunity to try it, he might use it instead of some of the older methods. It would, for instance, be more scientific than throwing a sod of earth into the sty.

There was a point about linseed cake which had perhaps been missed. He believed that everybody agreed that there was nothing like linseed cake to put a "finish" and a "bloom" on an otherwise fat animal, but it was not superlative from the point of view of the supply of essential amino-acids—it was, however,

untouched for use during the last six week's fattening for show purposes. In that last six weeks' fattening, however, there was always some danger that the breeding life of the animal might be temporarily, or even permanently, injured by excessive feeding.

In reply to Mr. McIntosh, he must quite honestly refute the suggestion that there was any merit due: all he had done was to wade through other people's work and give the result of his own experiences as far as they had gone. He would like to associate himself entirely with the remarks made by Mr. McIntosh concerning the lack of research work as applied specifically to the horse. The veterinary profession and nutritionists generally must plead guilty to having neglected research work on the feeding of horses, not only in this country, but abroad as well. There was really very little accurate knowledge of the food requirements of either the working horse or the racing horse; this was a remarkable thing when one considered the amount of money sunk in the horse-breeding industry. Work had been done on the food requirements of every other animal of the farm, including the fowl, but practically no attention had been paid to the horse. The explanation might be the high initial cost of experimental material. At all events, it was a gap in nutritional knowledge which ought to be, and he hoped one which would be, filled.

Major Hicks had made reference to bloodstock and had enquired regarding the amounts of fibrinogen which could be fed to such animals. Fibrinogen had been fed up to half a pound per day to lactating mares, mainly to make up the deficiency which occurred in the grazing during a very dry summer; *i.e.*, to increase the mare's flow of milk while she was suckling her foal. It had not been used for the pregnant mare. He thought that there was a danger in giving an unduly high quantity of protein to a pregnant mare, certainly during the last two months or so, because there would be a tendency for the muscular development of the foal to be increased to such an extent that there might be difficulty at foaling: that was a difficulty that had occurred in ewes, in particular. He should hesitate himself to feed high quantities to a mare before she foaled: certainly during that last two months, but he should not hesitate to feed quite considerable amounts of it after she had foaled. For ordinary purposes, about 2 to 4 oz. added to the rations for foals and yearlings was adequate, but the lactating mare could easily take 6 to 8 oz. It should be noted that a mare getting blood meal for the first time might not touch it: that could be overcome by starting her with a very small amount and mixing it with brown sugar, which had a moisture content which enabled the blood meal to be mixed with it and distributed through the ration. The taste of the sugar together with its cohesive nature made the mares take the fibrinogen quite well eventually. With regard to foals after they were weaned, the method adopted in one place was to start a foal off with a little box feeding: the mare was fed in one half of the trough and the foal in the other half; the latter was started on blood meal a fortnight before it came off the mother.

Concerning the epistaxis that occurred after racing, he did not know of any case where fibrinogen had been tried and except perhaps on general grounds he did not think that one could logically conclude that it would do anything towards preventing such an epistaxis; he thought, however, that it might enable the animal to replenish its blood supply where there had been a considerable degree of traumatic or other hæmorrhage.

In regard to anæmia in young pigs, the instance quoted by Major Hicks showed that even in the old days, though perhaps the reason was not known, the addition of copper had been found beneficial. As to the anæmia of foals following parasitism, he supposed that milk was probably the very best thing that could be used, but he imagined that milk might be an expensive agent in a serious outbreak amongst ordinary young horses; it would be cheaper to use the blood meal.

Concerning Brigadier-General Mosley's remarks, India presented an extraordinarily interesting problem in many ways: it remained for India to bring to light one of the most striking of the avitaminoses, *viz.* avitaminosis A. The striking results of feeding vitamin A in the diet were shown by the checking of the occurrence of blindness in newly-born calves in the Quetta experiments. There was now no xerophthalmia or keratosis in the eyes of calves born from cows that had been treated by giving vitamin A. He received a letter the previous day from a place in the Midlands, in England, to say that they had encountered what they thought was avitaminosis A in a herd of cattle there and that they hoped to stop it by feeding vitamin A. He had mentioned avitaminosis as one instance that India had its own particular feeding problems, even more outstanding than were met with in this country.

In regard to sterility in mares in high condition the earlier idea was that in consequence of heavy feeding the genital organs became loaded with quantities of fat; however, if one cut sections of ovaries from an animal suffering from diffuse lipomatosis, one found that there was no sign of fatty degeneration. It might be that fat mechanically interfered with the normal processes of reproduction in those abnormally fat animals. It was, however, a more encouraging thing to believe that it was due to an over-stimulation or an excess of the wrong kind of protein, because that could be so much more easily rectified.

In reply to Mr. Nevill King, what he meant to indicate was that a deficiency of the right kind of amino-acid or an excess of one or more of the wrong kinds, might interrupt reproductive functioning. He quite agreed that the evidence was not conclusive yet, because most of the references to it were contained in reports on work carried out only in 1935, but it would probably be possible to give a more precise answer as time went on and more work had been done.

In the matter of a reasonably balanced ration, that entirely depended upon what foods were available that it was proposed to feed. It was a very dangerous thing to give a "ration" to anybody: it was a far easier thing to take a given "ration" and try to correct its deficiencies and balance it by the necessary additions and adjustments.

He thought that he was correct in saying he had tried to cover most of the points which were raised—rather superficially probably, because, as mentioned, there was really a lack of practical applied knowledge on many of those aspects. This, he thought, could only come as a result of applied field experimental work, which took time.

In conclusion, Professor Miller said that he would like to thank the Society very much indeed for listening so patiently to a subject about which everyone might not be so enthusiastic as he was himself.

Some Modern Remedies and Treatments

Mr. Richard Hudson, F.R.C.V.S., of Retford, Notts., in the course of an address on the above subject, delivered at a meeting of the North Midland Division, N.V.M.A., held at Sheffield on December 12th, 1935, said that while the flood of new remedies, good bad and indifferent, was of such volume that it was difficult for the practitioner to keep pace with them, he hoped to mention some that would be sufficiently interesting to provoke a good discussion.

Dealing first with *acetylcholine*, Mr. Hudson stated that this derivative of choline and lecithin stimulated peristalsis by acting on the sympathetic neryous system. His interest in this agent having been aroused by the excellent account of its use given by Mr. Harvey a few months ago in *The Veterinary Record*, he tried it on a four-year-old Shire gelding suffering from flatulent colic, the result of feeding on kale. The gelding was very tympanitic and he administered 5 c.c. hypodermically. Visited again about seven hours later, he found the gelding in the same condition; neither flatus nor fæces had been passed and no bowel sounds of consequence had been heard. The animal then received, by stomach tube, ol. tereb. 2 oz., liq. ammon. fort. ½ oz., ol. lini to 24 oz., in one gallon of warm water. On the following morning the tympany had subsided, the bowels were slightly moved and the horse was free from pain. Later in the day the gelding was examined *per rectum* as no further fæces had passed: the rectum contained fluid contents and he could not feel anything solid. The animal died during the night and the *post-mortem* examination showed liquid ingesta throughout: it appeared as though the intestines had lost all power of expulsion. The mucous membrane was dirty grey in colour and not inflamed. He wondered whether the horse was poisoned by the kale, or whether the bowels were paralysed by their intense inflation. This case induced him to ask, however: Was the action of the drug such a shock to the sympathetic nerves that they could not recover after its action was spent?

Lentin, which he understood to be a similar preparation of vegetable origin, he had not used, but he had heard it well spoken of in colic cases, while *Istizin* (*Istin*) was so satisfactory that he continued to employ it.

The numerous preparations of *calcium* had a wide and extending field of employment. He could see a marked decrease in the number of chronic diarrhœa cases in cattle fed on rations containing added calcium. In lambing sickness and in that disease associated with fatty infiltration of the liver in ewes, its good effects were well known, while in hæmorrhages, *post-partum* and otherwise, calcium had a decided effect in preventing shock and arresting bleeding. In cases of bloody milk, however, he had not found it so efficient.

This agent was said to have a good effect in the treatment of hysteria in dogs, about which he hoped to hear something in the discussion.

For veterinarians, however, the predominant use of calcium was in the treatment of milk fever: in the prevention of milk fever he had not noticed any influence when calcium was given in the form of an addition to the food.

Several preparations of calcium were available, among them being the gluconate, the lactate, calcium dextrose and glucose D, while calcium chloride used intravenously was the most rapid in action. For milk fever he used calcium chloride 1 oz., magnesium chloride 2 drams, formalin ½ dram, water 16 oz., injecting slowly into the jugular vein. Dryerre had noted that following injection calcium disappeared from the blood stream in about four hours; therefore if the cow was not up in that time one should be prepared to repeat the injection.

Calcium chloride might also be used intramuscularly in ewes with safety—*vide* report in *The Veterinary Record* on the treatment of metabolic disturbance of ewes in a London park. In ewes showing paralysis and other symptoms of nervous derangement before lambing, he gave it *per os* with liq. strych.

Material improvement had been effected of late in calcium preparations. Calcium gluconate had been much improved as a subcutaneous injection for milk fever since the addition of boracic acid was suggested, while calcium dextrose and lactate were now more concentrated and were perhaps the best calcium agents for canine practice.

Magnesium might be used as chloride or sulphate, but the sulphate must not be added to a solution of calcium salts. It was used with calcium intravenously in milk fever to prevent heart block; also in grass tetany—where its use, in his hands, was of doubtful value: he doubted if the dose was sufficiently large—and in tetanus—here again without apparent benefit, so far as his cases were concerned. The saturated solution certainly set up a large swelling when the injections were repeated.

Mr. Hudson proceeded to say that he found *luminal sodium*, given subcutaneously, useful in tetanus in horses, using 1 dram in 2 oz. of sterile warm water daily, also in cows showing what one might call symptoms of meningitis.

Mentioning *parenchymatol silver albumen* "because he hoped to hear something about it," the speaker passed to *ichthyol*, observing that Mr. Barker had given them a demonstration of its use in sterility in cows: he himself had found it to be better than iodine solution. He had three out of five, five out of seven, and many odd cases hold to service after injection, using it in glycerine one in five. Ichthyol had a high sulphur centent (10·3 per cent.), and as sulphur was held to be a remedy for contagious abortion, it might exert a beneficial effect in this disease.

Dimenformon (dihydroxy œstrin benzoate), the dose of which was 50,000 units, given intramuscularly, was used for the production of œstrum in cattle and in pigs. One cow on which he tried this agent and which had not been in œstrum for several months came in œstrum within twelve hours. She was injected on January 10th, served on January 11th and calved on October 22nd. Two heifers were also injected. One came on in four days, the other had not shown signs after several weeks. Œstrum was fairly regular when it returned but neither held to service. To many of the agents mentioned he had made reference in a previous paper. *Aricyl* was one of these, but he mentioned it again, being asked for a remedy for eczema in the dog: he knew of nothing so efficacious.

Myosalvarsan (intramuscular injection of arseno-benzol) was used for blackhead in turkeys, but it should be applied at the onset of an outbreak of the disease or before as a prophylactic. Used late in the disease, when the birds were poor in condition and the liver largely destroyed, there was not much chance of the cured birds being fed at a profit.

Dealing next with sera, Mr. Hudson observed that they all recognised the value of *swine erysipelas serum* in that disease, but it was also of value in other diseases of the pig, such as enteritis and pneumonia, apart from swine fever.

Swine fever serum was of very doubtful benefit; indeed he might go so far as to say that it was useless in infected herds—perhaps because the animals were already infected or the owner would not put a diseased pig along with the inoculated ones. Moreover, the period of immunity was only of short duration.

His personal experience of *distemper serum* was not sufficiently extensive to enable him to say much about it. Used together with distemper virus as a prophylactic he thought it had proved its value and saved time and expense.

Following a reference to protein therapy—use of protein preparations of a non-specific type—in which he stressed the difficulty of assessing the correct dosage, Mr. Hudson turned to the subject of Vitamins, acknowledging his indebtedness, in this connection, to the Medical Research Council's book on the subject. In the course of his observations under this heading, Mr. Hudson asked, "How often have we heard a farmer say that he hesitates to turn out his stall-fed cows at the spring of the year because they will not eat their food when they come in? How often have we been told that a dog will not eat his biscuits after he has been ordered a meat diet?"—and continued: Given an opportunity to get the food nature intended for them, animals would not suffer from lack of vitamins. He did not think that there was anything wrong with British food stuffs: it was the foreign and prepared foods that were the most likely to cause trouble. Vitamins were intricate and essential food factors, necessary for growth, good health and reproduction, present in the food nature intended the animal to have. Sunlight, exercise and fresh air played an important part in their development both in plants and animals.

In the course of detailed observations concerning the occurrence and properties of some of the vitamins, Mr. Hudson made the following remarks:

Vitamin A was a fat-soluble food factor, in which green vegetables were specially rich. Its absence or deficiency in the diet of dogs resulted in diminished lachrymal secretions, dryness of the eyelids, irritation, rubbing, infection, ophthalmia and resulting phenomena; also possibly the formation of those pit-like ulcers ofter seen before inflammation was noticed and frequently ending in ophthalmia and serious ulceration, or, again, blindness due to a defect of the retina and possibly to paralysis of the iris and abnormal pressures in the anterior and posterior chambers. It was also responsible for some cases of paralysis in over-fed, lazy old dogs, and for a dry, itchy, dandruffed condition of the skin. Keratinisation predisposed to skin infection by causing irritation and scratching and might result in dermatitis.

Sterility in the cow often vanished when spring arrived. In pigs, lack of resistance to bacterial infection was often noticed in animals on diets deficient in vitamin A, while Professor Mitchell, in *The Veterinary Record* (14th December, 1935) had mentioned the possibility of vitamin A deficiency being responsible for the extensive rheumatic condition in horses which he had been investigating for several years. The estimated vitamin content of the foodstuffs given normally to horses would cause some surprise when we knew how well they had served us both for breeding, growth, and work, and he thought that more remained to be said about these deficiencies.

Vitamin B.—Intensive research had shown the water-soluble food factor known as vitamin B to be composed of several factors which were described as vitamins B_1, B_2, B_3, B_4, and B_5, and which were too complex and perhaps too indefinite to be dealt with that night.

Vitamin B might be found in all cereals and almost entirely in the pericarp and germ, there being evidence that where the pericarp and germ had been extracted and the endocarp fed alone, certain well-known diseases had followed, the chief of which were beri-beri—a degeneration of the peripheral motor and sensory nerves—and pellagra, a disease with a syndrome of dematitis, inflammation of the alimentary tract from the mouth to the rectum and in later stages, mental disorders. A notable feature in the experiments carried out with vitamin B was that there could be produced in dogs on a diet of wheat flour biscuits, peas and cottonseed oil, a syndrome like that of canine typhus or Stuttgart disease. In from one to six months these animals showed necrosis and gangrene of the tongue and buccal mucous membrane, bloody diarrhœa, and usually died. The inclusion in the diet of a large amount of peas or small amounts of lean meat delayed exhibition of those symptoms. Crystallised carotene and vitamin A, however, cured this experimental disease—a fact which cast doubt on lack of vitamin B_2 as the cause, especially as meat, rich in the vitamin B_2 factor, failed to cure it. With the exception of dogs fed on wheat flour biscuits, he did not think that any of their animals were likely to suffer from vitamin B deficiency.

Vitamin C, known as the antiscorbutic vitamin, was present in green vegetables, fruits—particularly lemons—and roots, especially swedes. The symptoms of scurvy in guinea-pigs were tenderness and swelling of the joints, inflammation of the gums, loosening of the teeth, hæmorrhages—mainly in the limbs—rarefaction of the long bones and factures at the epiphyses, swellings and fractures of the ribs at the cartilage junctions.

Pigs were said to thrive on a scorbutic diet and at the same time to produce vitamin C in their livers; in fact, he could not find any reference to scurvy affecting our animals, though he was not so sure about pigs, even if they could manufacture vitamin C from some unknown source.

Vitamin D, a fat-soluble food factor found in cod fish liver and in the livers of various fishes in varying amounts, was also present in butter fat, egg yolk and in small amount in the livers and fats of various mammals. It was present in small quantities in grasses and some green stuffs but was soon lost after cutting. Ergot was a source of supply. Vitamin D was synthetised by the action of sunlight on the animal and might be absorbed through the skin when rubbed in as irradiated ergosterol. Milk from summer-grazed animals was richer in vitamin D than was winter-produced milk, unless vitamin D was added to the food.

This vitamin controlled the formation of bone and teeth and its absence or insufficiency in a diet was responsible for the production of rickets, parodontal disease, pyorrhœa and infantile tetany, while it was specially of importance to us in its relation to stock-rearing and the rearing of small animals and birds, particularly in the winter months. In its control of the calcium element, vitamin D might play a part in tetany, milk fever, hysteria and eclampsia.

Vitamin D was destroyed or reduced by heat; and in the process of pasteurisation of milk it was either weakened or destroyed. Though some authorities denied this, all admitted that pasteurisation destroyed the diffusible calcium in milk. Therefore when milk was pasteurised or boiled, vitamins should be added.

Vitamin D content was increased in various preparations by irradiation with ultra-violet rays, but it must not be forgotten that sunlight, as ray treatment, was both efficient and free.

Vitamin E was a fat-soluble food factor the deprivation of which produced sterility in the female by causing death and reabsorption of the fœtus, and sterility in the male by producing a degeneration of the germinal epithelium of the testes. After administration vitamin E might be stored sufficiently long to enable an animal to carry through a normal pregnancy. A concentrate might be obtained from wheat germ oil, but the richest natural source was the green leaves of vegetable plants and the embryos of seeds.

The intramuscular injection of single doses of wheat germ oil in eleven sterile but healthy cows operated successfully in nine cases.

Eggs from hens deprived of vitamin E in their food failed to hatch out.

Discussion

Mr. E. Marrison, who opened the discussion, referred first to the dosage of istizin, saying that he found that 2 drams was sufficient for hunters and that he would hesitate to give a larger dose. In his experience the action of calcium preparations in hysteria was variable; some cases benefited and others showed no improvement. He liked to use glucose D given in food, but he preferred glucose and calcium dextrose in hysteria. Thymol was of value for the preservation of calcium solutions for subcutaneous injection. For grass tetany he used magnesium sulphate ½ oz. in 4 oz. of water. Concerning the use of parenchymatol silver albumen, a farmer told him he had had a remarkable recovery of a cow with mastitis following an injection of this agent, presumably into the teats. He was using manganese butyrate solution, 3 c.c., injected twice, and had better results than with collosol manganese. He employed ichthyol and olive oil and glycerine in equal parts as a liniment in mastitis and also ichthyol in glycerine, 10 per cent., as an injection into the uterus in retained placenta. In a case of acute mastitis in a cow he had injected 10 oz. of a 10 per cent. glycerine ichthyol solution daily and had had a remarkable recovery. For distemper he had had good results with Parke Davis canine bacterin.

Mr. F. Scott spoke favourably of colloidal kaolin in the treatment of gastric and intestinal diseases in dogs and of kaolin poultices and dressings in wounds. Benefit had followed injections of calcium and magnesium in grass tetany and, speaking generally of cases in cattle needing hypnotics, he had good results from the use of chloral hydrate *per rectum*. Would the essayist prefer luminal sodium? He had found parenchymatol silver albumen of service in many cases and mentioned one cow in which the quarters underwent resolution and the cow, on calving the next time, gave nine gallons of milk daily. On *post mortem* examination in cases of obstruction of the stomach and small intestines he discovered very variable conditions and often a large quantity of fluid in the stomach which, he thought, indicated a pyloric stricture difficult to account for. He thought that many of these cases were due to atony of the intestinal muscles and that food poisoning followed: food poisoning readily developed when the passage of food along the small intestine was hindered. In such cases several hours might elapse without pain before death ensued. He had used acetylcholine and arecolin, but preferred, particularly in impaction due to wheat, an intravenous injection of colloidal sulphur.

Mr. G. R. Jamieson referred to wheat germ oil and the satisfactory results that might be obtained by intravaginal injection as had been proved experimentally in Scotland at the Rowett Institute. He had noted the good effect of ichthyol when used in eczema in the dog.

Major G. Green spoke of the value of the administration of radiostoleum, given in small doses to dogs with gastric troubles; also of that of vitamin C, as orange juice, to puppies with scurvy. Ichthyol collodion was good for eczema with irritation, while he had used aricyl with good results in this and many other diseases, particularly in cases of paraplegia in dogs. Colloidal manganese was a good remedy for canine gastritis.

Mr. T. C. Fletcher supported Major Green's concluding observation that nemurol was an excellent remedy for worms in dogs and one that was readily taken in the food.

Mr. W. Collinson recounted the case of a horse which lived a fortnight with the intestine blocked with a hair ball, showing that food poisoning did not readily take place in equines. In lambing sickness he had not found any calcium preparation to be of much service: he advocated exercise. Such cases as had benefited were of a milk fever type, such as those recorded as having occurred in Hyde Park. Lambing sickness and milk fever often presented many features in common, as regarded causation and symtomatology. Parenchymatol silver albumen must be injected high in the quarter if good results were to be obtained, such as he had had in early cases: it was useless in late cases and in those with pus-like secretion. He had found myosalvarsan to be of value. For milk fever he used the cartons of calcium Sandoz and boracic acid—2 to 3 oz. in 12 oz. of boiling water, injecting from the saucepan when cool enough. He found distemper serum good as a curative agent if adopted early and radiostoleum to be of service in the treatment of paralysis in dogs.

Captain E. F. Angler asked if ichthyol was of any value for sterility in mares. He agreed with the essayist that half-ounce doses of istizin were necessary for the efficient purgation of hunters and racers: he would give 2 drams to a yearling. It was a good purgative and rarely refused in a mash.

Mr. Hudson, replying to the points raised in the discussion, said that he appreciated the mention of drugs to which he had not referred, but he had to have a limit. He never gave less than half ounce of istizin to a horse and he sometimes gave one ounce, often, in cases of stoppage, following the administration of linseed oil or 6 or 8 drams of aloes. Thymol was a good preservative and of service for made-up solutions of calcium and boracic acid and glucose, which did not keep well. For the preservation of solutions for subcutaneous injection, however, he himself used a few drops of chloroform. He did not value farmers' observations regarding mastitis: most of them did not know mastitis from œdema of the udder. In his opinion manganese butyrate possessed no advantage over collosol manganese. Ichthyol had, of course, other uses than that he had mentioned, and if it proved specific in metritis Mr. Marrison would have conferred benefit upon them that evening. He had heard of recurrence in grass tetany, but had not had such a case under treatment. He would prefer the subcutaneous use of luminal sodium to the administration of chloral hydrate, as the action of the former would be more certain. In his view, the existence of stricture of the pylorus was unlikely: some cases of fluid distension

MR. A. SPICER'S CASE: SUSPECTED PERTHES' DISEASE IN THE DOG

Clinical Communication

OSTEOCHONDRITIS DEFORMANS COXÆ (PERTHES' DISEASE): SUSPECTED CASE IN THE DOG

ARNOLD SPICER, F.R.C.V.S.
New Oxted

Subject.—Fox-terrier puppy, born October 13th, 1934.

History.—Early in April this puppy squeezed under a gate and, so far as could be gathered, no other source of injury presented itself. Three weeks later, lameness developed at the trot but he could walk and gallop well and played freely with his companion. He was, however, always stiff after resting.

On examination the pectineus muscle appeared to be thickened and was painful on pressure. Extension of the joint provoked pain.

Examination.—The dog was first seen on May 14th, 1935, and treatment gave no relief. A tentative diagnosis of Perthes' disease, based largely on the history, was made, and on July 6th an X-ray picture was taken which more or less confirmed the diagnosis. The radiograph was shown to an orthopædic specialist, who declined to give a definite opinion because the film was not good enough. On July 20th three more films were taken and on these pictures the diagnosis of Perthes' disease was confirmed by the same specialist, by the radiologist who took the film and by another radiologist from the Orthopædic Hospital.

Radiographic Report.—The report on the radiograph was as follows:—

Left Hip.—The head of the femur and the acetabulum appear perfectly regular and even in outline. The epiphyses have united in a normal manner.

Right Hip.—The acetabulum is much wider than normal and has a square rather than a circular outline. The joint space is not narrowed, nor is there any evidence of joint infection. The head of the femur is widened in the antero-posterior view and the epiphyseal lines, which can still be faintly seen, show that there has been division of the epiphysis into two or three sections. In the lateral view, the head of the femur appears to be very rough and irregular and almost square in outline.

Salient Points in the X-Ray Appearances of Perthes' Disease of the Hip

At the beginning of the disease, the form of the head of the femur may appear quite normal in the X-ray picture even with pronounced clinical symptoms. After a few months, the femoral head becomes flattened out and broadened. In the anterior of the head and in the epiphyseal parts of the neck bordering upon the epiphyseal line there appear spots in the bone which are translucent to the X-rays.

In more advanced stages, the epiphysis shows an apparent disintegration into several parts. The epiphyseal line tends to become horizontal and the femoral neck becomes broader, as also does the articular cavity.

In the human subject Perthes' disease is always associated with an injury. In the rabbit the disease can be produced experimentally by injury to the blood supply and I believe it has been produced in the dog by the same method.

January 26th.—The dog has now practically recovered. It is no longer lame, nor is pain evidenced on the application of pressure to the pectineus muscle.

Conclusion.—It would appear that Perthes' disease can occur in the dog, but many more cases will have to be reported before a definite assertion can be made of its occurrence in that animal.

[Editorial Note.

This is the second occasion during the past few months upon which we have published a report of a suspected case of this disease in the dog. In each the diagnosis has been based chiefly upon the radiographical picture of the hip joint. As yet a pathologist's report of the histological changes has not been available.

It is thought that the following, taken from Rose and Carless', Manual of Surgery, 1933, will be of help to readers in forming an opinion.

"Pseudo-coxalgia or Coxa Plana (Syn.: Osteochondritis Deformans, Legg's, Perthes' or Calve's Disease, Quiet hip disease, etc.)—The multiplicity of names associated with this disease is, as ever, a measure of the ignorance as to its nature which still exists. It occurs most frequently in boys between the ages of three and twelve years, and may be mistaken for tuberculous hip disease if careful radiography is not employed; it is not very uncommon. There is often a history of injury some months beforehand, but syphilis, rickets, and anomalies of ossification have all been called in to explain its origin, probably without justification. A low grade infection with attenuated pyococci of the rheumatic type may be causative but this is as yet non-proven. Radiography reveals that the head of the bone consists of a flattened, laterally expanded, fragmented epiphysis; the fragments ultimately fuse, so that the head of the femur

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might follow outside pressure on the duodenum from tympany of the bowels. The injection of wheat germ oil into the vagina was interesting because he recognised that materials could be retained in and absorbed from the vagina in cattle: he had experimented in that direction and devised a special, long fine-nozzled syringe for such injection. Exercise or, better, compelling the ewes to seek their food over a wide range, was essential in the prevention of lambing sickness. A case was mentioned in illustration.

In a case in which he had used distemper serum at the onset of the disease it had failed, but he was pleased that Mr. Collinson had found it a good remedy, as his own case might be an exception. He had no knowledge of ichthyol being employed for rectifying sterility in mares: it might be useful, but he had not tried it.

develops into a permanently expanded or flattened cap, encroaching along the upper aspect of the neck towards the trochanter. Many cases of congenital dislocation of the hip show after reduction a flattening and fragmentation of the head exactly similar to that seen in coxa plana.

"The symptoms are a gradual onset with but little pain, moderate lameness, and slight limitation of movement, especially of internal rotation and abduction. The muscles around are somewhat atrophied, and the joint is irritable and liable to attacks of pain, if much used or strained. The condition is usually unilateral, but both sides may be involved, and the patient is apparently in perfect health. The disease progresses over a period of years to a cure, but osteo-arthritis is likely to ensue."]

BRITISH LIVESTOCK FOR AUSTRALIA

An important announcement affecting the trade in pedigree livestock between the United Kingdom and Australia is made by the Council of the Royal Agricultural Society of England.

Financial assistance in the form of a contribution towards the expenses incurred in the importation of animals is to be afforded by Australian interests. The shipping companies have agreed that, in place of the freight rates usually applied, they will charge only out-of-pocket expenses actually incurred in the provision of stalls, water, etc., and in loading and unloading the animals. These out-of-pocket expenses will be 30 guineas in the case of cattle, ten guineas for sheep and goats, and six guineas for pigs.

All expenses connected with the transport of the stock from the port of export in the United Kingdom will be borne in the following proportions: two-fifths by the importer, two-fifths by the Commonwealth and State Governments concerned in equal proportions, and one-fifth by the Commonwealth Bank subject to review after June 30th, 1936. The scheme will apply only to animals for which a certificate of full registration by a recognised stud or breed society is furnished, together with the vendor's certificate of breeding and production record.

Sir Merrik Burrell, president of the Royal Agricultural Society, speaking at a meeting of the council, said that the scheme might be expected to give a stimulus to the export trade. The arrangement made showed a broadmindedness and a patriotic spirit which he hoped would be an example for other Dominions to follow.

Lord Bledisloe, referring to the New Zealand embargo against British livestock, said that nothing would more encourage the consolidation of opinion in New Zealand than the expression of the view by the Royal Agricultural Society and the breed societies that the likelihood of foot-and-mouth disease being imported into the Dominions was most remote, having regard to the length of the voyage and the delatively short period of incubation of the virus of the disease.

Sir Archibald Weigall said he thought the opportunity was now presented for calling the attention of New Zealand farmers to the action of the Commonwealth.

The Council decided to ask its Veterinary Committee to prepare a letter for submission in the name of the society to the New Zealand Government.

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The balance-sheet of the Royal Veterinary College dance, organised by the Edgbaston Riding School, Birmingham, on December 13th, shows that the receipts were £52 8s. (tickets £46 2s. 6d.) and expenditure £31 8s., leaving a balance of £21, which has been sent to the College.

Abstracts

[**I.—Synthetic Diets for Herbivora, with special reference to the Toxicity of Cod-liver Oil.** Madsen, L. L., McCay, C. M., and Maynard, L. A. (1935.) *Cornell Univ. Agric. Exp. Stat. (Ithaca, N.Y.).* Memoir 178.

II.—Action of Certain Fat Substances on the Metabolism of Bone-Abettors or Antagonists of Antiscorbutics. (Trans. title.) Mouriquand, G., and Michel, P. (1922.) *C. R. Soc. Biol. Paris.* **86.** 1170.]

Only rarely have cases of death in children due to hypervitaminosis been recorded and that reported by Thatcher (*Lancet*, **230**, 20) has focussed attention once again on the toxicity of cod-liver oil, the medium by which the vitamin was administered. Agduhr, one of the principal contributors to the study of this subject, has been much criticised, however, owing to his interpretation of many of the histological sections depicted in his published work. The articles abstracted briefly below show two aspects of the subject, since the pathological pictures described by the authors are entirely different.

Madsen, McCay and Maynard, using 200 animals including guinea-pigs, rabbits, goats and sheep, showed that addition of cod-liver oil to a synthetic diet, composed of regenerated cellulose, cornstarch, casein, sucrose, yeast, lard, and a comprehensive salt mixture, proved harmful to most of the animals. Rabbits, guinea-pigs and, to a less extent, goats, developed a paralysis which was found to be due to a degeneration of the skeletal muscles. The heart muscle was also affected and a very fatty liver was a characteristic finding. Sheep, on the other hand, were able to be reared successfully on the diet over a period of 480 days if the daily amount of cod-liver oil was kept at 0·1 g. per kilogram body weight. Sheep died after 226 days if the cod-liver oil intake per day rose to 0·35 g. and in 93 days if the daily intake rose to 0·7 g. per kilogram body weight. Substitution of a vitamin A-D concentrate for the cod-liver oil or the withdrawal of the cod-liver oil from the ration markedly delayed the onset of the lesions but did not entirely eliminate injury. The authors concluded that the cod-liver oil and some other unknown factor in the synthetic diet were the causative agents in the production of the lesions.

Mouriquand and Michel found that if cod-liver oil was substituted for olive oil or butter in a basal ration of barley and hay, guinea-pigs died within 107 days of a disease resembling scurvy and concluded that cod-liver oil must have been antagonistic to the antiscorbutic substances in the diet.

[The effects of excess cod-liver oil feeding depicted in the above abstracts must not be

confused with hypervitaminosis, which might possibly arise if cod-liver oil was fed in huge doses, but is probably due to the toxicity of some other component in the cod-liver oil, the most likely being one or other of the fatty acids. Much has been written lately regarding the need for a true vitamin balance in diets, since it is contended that want of balance may interefere with the action of one or other of the necessary vitamins and it might be concluded that the findings of Mouriquand and Michel support this theory. On the other hand, it might as easily be said that the guinea-pigs in question had been suffering from latent scurvy and that the loss of condition on addition of the excess cod-liver oil allowed the scurvy to manifest itself.

The truth regarding the toxicity of cod-liver oil is still obscured and much more work is necessary before it will be fully understood, but stockowners and their veterinary surgeons can rest assured that little harm will come to stock from feeding cod-liver oil or vitamin concentrates in the recognised doses suggested by the manufacturers of the various products on the market.]

J. S.

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[**Border Pining in Sheep—I.** Stewart, W. L., and Piercy, S. E. (1935.) *J. Comp. Path. & Therap.* **48.** 3. 157-191.]

The writers define "Northumbrian pining" as a chronic wasting disease of hill sheep characterised by anæmia and emaciation. It occurs in certain valleys among the Cheviot foothills, other parts of the county being regarded as free from specific pining. Mention is also made of a similar disease, "blood rot," which occurs in neighbouring valleys but may be distinguished from border pining by its much more rapid course and onset. In 14 cases of blood rot heavy infestations of gastro-intestinal parasites, chiefly *Hæmonchus contortus*, were found. *Post-mortem* examinations in 13 sheep suffering from pining showed evidence of parasitic gastritis in every case, the predominating species being *Ostertagia*.

Pining is at its height in the summer, but sub-acute cases linger until early spring, when death may occur from a variety of end causes. The number of parasites present varied with the season—in the cases which survived to winter or early spring there was a reduced total parasite count together with complications such as under-nutrition and bronchopneumonia.

The anæmia in pining is not identical with that described by Fourie in hæmonchosis. In typical cases there is a reduction in red cells and hæmoglobin to about half the normal. The differential leucocyte counts of sheep on pining farms showed a decrease in neutrophiles with an increase in lymphocytes and eosinophiles as has been previously recorded in ovine parasitic gastro-enteritis. It is stated that the number of ova in the fæces varied inversely with the severity of the disease and intensity of the anæmia.

J. S. S.

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[**The Control of Parasitic Gastritis and Enteritis in Sheep by Treatment with Copper Sulphate and Nicotine Sulphate.** McEwen, A. D. (1935.) *J. Comp. Path. & Therap.* **48.** 3. 218-235.]

As a result of experiments on the treatment of sheep suffering from parasitic gastritis and enteritis not due to *Hæmonchus contortus*, McEwen concludes that the more serious effects of nematode infestations of sheep and lambs grazing on permanent pasture in this country may be prevented by the repeated administration of large doses of a 5 per cent. solution of copper sulphate containing 5 per cent. of a 40 per cent. solution of nicotine sulphate. The animals used in the experiments were selected so that evidence of the disease was positive at some time during the course of the experiments, and yet was not produced by infestation with *Hæmonchus*, as it is well known that copper sulphate is effective against this species.

From June to September the treated and control groups (40 in each at the commencement) appeared equally heavy, but by December there was a marked difference between the two groups. Two of the treated sheep died from parasitic worm infestation while being dosed at intervals of a month. Subsequently, dosing was practised twice monthly, and there were no more deaths. The percentage of deaths in the treated sheep amounted to 8·3 per cent., whilst the mortality in the control group was 47 per cent. The average gain in weight per animal surviving to the end of the experiment was 1·7 lb. in the controls and 17·5 lb. in the treated sheep. The treatments were administered on 14 occasions between June and March, the doses varying from 10 to 20 c.c.

At the end of the experiment the original control group was divided into three sub-groups which were treated with nicotine sulphate, copper sulphate, and untreated respectively. Two of the nicotine sulphate group died, four of the copper sulphate group and six untreated sheep died. However, the survivors of the nicotine sulphate group did not lose weight so rapidly or to such an extent as the others. It is suggested, therefore, that treatment with nicotine sulphate is superior to that with copper sulphate.

Finally, the surviving animals were sold at public auction and the value of the sheep treated

with copper sulphate and nicotine sulphate was more than twice that of the original (surviving) controls—(the 32 treated sheep sold for £70 12s., whilst the 20 surviving from the original control group sold for £31 15s.).

J. S. S.

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[**The Effect of Certain Ectoparasites on the Cellular Elements and Hæmoglobin of the Blood of the Domestic Chicken.** Olson, C. (1935.) *J. Amer. Vet. Med. Ass.* **87.** 5. 559-561.]

A study of the blood of fowls spontaneously affected with lice has been made. The affected flock was divided into two portions, one of which was placed in clean quarters and treated with nicotine sulphate until the birds were parasite free; the other was left untouched and served as a control. A slight anæmia was present in the chickens severely infested with lice; there was also a thrombocytosis and leucocytosis, but differential leucocyte counts revealed little or no variation that could be attributed to the effects of the parasites. The blood from chickens 30 days after treatment did not show any great variation from that of the untreated birds and the author concludes that a severe infestation with lice is not associated with any marked anæmia.

J. A. N.

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[**Chronic Hæmaturia in Milch Cows.** (Trans. title.) Gottardi, G. (1935.) *Recueil Méd. vét. Alfort.* **3.** 6. 370-372.]

Chronic hæmaturia is more frequently seen in lactating or pregnant cows and is characterised by the excretion of blood-stained and protein rich urine. This is accompanied by severe anæmia, cachexia, anorexia and general ill-health and an attack may last for several months. The most common lesion is a diffuse, hæmorrhagic nephritis with degeneration and destruction of the tubular epithelium and glomeruli and a leucocytic infiltration of the interstitial tissue; cystitis may also be present. The disease is non-infectious and cannot be transmitted experimentally, so that it is not caused by a virus or bacteria. On farms where outbreaks of the disease are common, analyses of the water have shown that it is rich in acids due to the soil being deficient in calcium. It has also been shown that there is a deficiency in calcium and phosphorus in the blood of affected animals. The author considers that the soil conditions are responsible for causing the disease and claims that the administration of calcium and a supply of good food and water to affected animals bring about a cure in a few weeks.

J. A. N.

[**Gonadotropic Hormones in the Treatment of Imperfectly Migrated Testes.** Spence, A. W., and Scowen, E. F. (1935.) *Lancet.* **229.** 5859. 1335-1338.]

It has been shown that injections of anterior pituitary gland or of pregnancy urine cause the descent of the testes in the scrotum of immature monkeys and the authors have tried the effects of the injection of gonadotropic hormone into human patients suffering from imperfectly migrated testes. Thirty-three patients were treated with 500 rat units of pregnyl twice weekly and in the majority of cases successful results were obtained within periods ranging from two weeks to fourteen-and-a-half months.

The normal fœtus while in the uterus is acted upon by the gonadotropic hormones present in the maternal blood, but these influences are removed at birth and if the testes have not already descended into the scrotum, it is probable that one or both will remain in the inguinal canal until they are influenced by an increased supply of gonadotropic hormone at puberty or at the period of rut. This accounts for the fact that the spontaneous descent of one or both testes often occurs in later life without any surgical or other interference. An insufficiency of gonadotropic hormone during fœtal life may not, however, be the only cause of undescended testes, since it is now known that œstrin is abundant in the blood of pregnant women and it has been shown that the injection of this hormone into immature rats prevents the testes from maturing and causes a failure in their descent. It is more probable that a combination of both factors is responsible for the undescended testis.

In the undescended testis, the seminal epithelium undergoes degeneration, but the interstitial tissue remains unimpaired and functional; on restoring the testis to the scrotum, the seminal epithelium regenerates and fertility is restored. This is the case in the rat, guinea-pig, dog, rabbit and sheep and is also probably true for man and the larger domestic animals.

J. A. N.

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Report

FIJI

REPORT OF THE VETERINARY DIVISION, DEPARTMENT OF AGRICULTURE, 1934

This somewhat belated report is of interest and importance because it describes further success in stock improvement by licensing entire animals and doing all possible to encourage the castration of undesirable stallions and bulls. In the cane-growing districts, this selection of breeding stock presents no difficulties as sires are distributed by one of the large companies. As cattle are largely used for draught purposes, the Zebu type has been introduced with success. Suffolk Punches have found favour as working horses—a breed not often found in the colonies. In the copra areas, economic conditions are making animal improvement less easy.

Amongst diseases, tuberculosis is of the greatest importance, particularly in dairying districts. Testing shows a steadily and encouraging lowered percentage amongst the animals of these herds, which have been so treated for some years. Contagious abortion has rather suddenly become of importance, the infection being so serious in some herds that the use of live vaccine has been resorted to.

Import duties upon butter and ghee substitutes have increased the confidence of those engaged in dairying and this is leading to attempts to import more suitable animals.

Although only two veterinary officers are employed, they appear to be carrying out a progressive policy in a satisfactory manner.

J. S.

HORSE OWNER'S REFERENCE BOOK

The Horse Owner's Reference Book for 1936 has been issued by the National Horse Association, of 12, Hanover Square, London, price 1s. net; 1s. 2d. post. Contained in the 140 pages are some 500 to 700 dates of fixtures in which horses and ponies can participate, such as horse shows, races, parades, gymkhanas, and sales. It also gives a classified list of riding schools in all parts of the country, railway rates, champion animals of all breeds, racing and pony statistics. The addresses of the leading agricultural and horse shows have been included in addition to their dates in 1936. According to the Reference Book there are 39,656 horses in London, 1,893 stallions were licensed for service in England and Wales and a further 515 in Scotland, while there are 1,020,846 horses used on farms. Out of the 604 packs of hounds in the world 440 are in Great Britain.

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The fund for the Cecil Aldin memorial is still open, and Mr. G. P. Male, Westcroft, Earley, Reading, will be glad to receive further subscriptions to make this a fitting memorial to a great artist, who gave so much pleasure to thousands of animal lovers the world over. As already announced in these columns, it is proposed that the memorial shall take the form of a scholarship or bursary at the Royal Veterinary College.

From *The Veterinarian*

March, 1836

On the 17th inst., after a dinner at Freemason's Hall, a silver breakfast service, value 100 guineas, was presented to Mr. Sewell by the members of the London Veterinary Medical Society.

One of the pleasing circumstances of the day was, after a secession of ten or twelve years, the re-appearance of Professor Coleman presiding over a veterinary meeting. He was the chairman of the first meeting of this society; the chairman of its after meetings; and when the anniversary dinner became one of the profession generally, and then one of the students, the Professor of the Veterinary College still occupied the chair: it was one of the charms of every meeting, and thence, in the opinion of every veterinary surgeon with whom we ever conversed on the point, he should not have retired, although he did so to give place to the first surgeon in Europe. He was the first President of this Society; and he was once more at the post of duty and of honour.

When proposing "Lord Hill and the Army," the chairman alluded to the grade in society which every competent and well-conducted veterinarian was enabled to occupy, on account of the rank which the cavalry veterinary surgeons of England held as commissioned officers. He exulted in the satisfaction which, generally speaking, they had given to the colonels of their respective regiments, and the altered and more effective character of the cavalry service.

Proceeding to the essential business of the meeting—the presentation of a service of plate to Mr. Sewell by the London Veterinary Medical Society—Professor Coleman spoke of the Society. Some difficulties had attended its establishment, but he believed that it was now sincerely devoted to the improvement of the pupil and the art. He admired the freedom of discussion which prevailed in it, and he hoped that it would long continue to flourish. He thought that its members had discharged a pleasing but an imperative duty in presenting that token of respect to a gentleman who had so long presided over it.

Mr. Sewell, returning thanks, said that as to the London Veterinary Medical Society, he had for many years before the commencement of the present one belonged to another, from which he had derived much pleasure and improvement; but it had died away, and this had risen like a phœnix from its ashes. There were some difficulties attending the establishment of this Society, but they passed away, and it had now existed nearly three and twenty years, an ornament to the Veterinary College, and a source of much advantage to the pupils. He had early been appointed President of this Society and he had always regarded this as the highest honour that could be bestowed upon him.

Not one unpleasant word or feeling interrupted the harmony of this meeting, nor did any one regret the hours he trifled away there. No, he did not trifle them away;—for the object of all being ostensibly, we would fain hope honestly, the same, although the paths which we pursue in the accomplishment of that object somewhat materially differ, these friendly collisions are well calculated to do us good. The heart that beats with malignity, or jealousy, or a sense of real or fancied injury, is brought to a momentary pause—the circulatory vessels have time to contract upon their contents—they resume some-

(*Continued at foot of col.* 1, *page* 330.)

N.V.M.A. Divisional Reports

CENTRAL VETERINARY SOCIETY

A meeting of the above Society which was held at the Conway Hall, Red Lion Square, W.C.1, on the evening of Thursday, February 6th, 1936, was rendered memorable to the large number of members who attended by exemplifying the loss sustained by the veterinary societies over the Border and the advantage to the Central Veterinary Society of the recent transference of Professor W. C. Miller from Edinburgh to the Royal Veterinary College. Professor Miller has not been long in placing his southern colleagues deeply in his debt, and the address which he gave on this occasion entitled "Low Temperature Blood Meals as a Source of Essential Amino-acids for Nutritive Purposes" will stand out prominently in the annals of a Society which has always had good reason to pride itself upon the quality of the papers presented for the consideration of the Fellows.

The chair was occupied by the Chairman (Captain J. F. Macdonald) and there were also present: Messrs. J. H. L. Addis, L. S. Balls, W. Brown, H. E. Bywater (Hon. Treasurer), J. J. Davies, C. Formston, Major T. Hicks, Messrs. J. W. H. Holmes, H. D. Jones, Herbert King, H. C. P. King, Nevill S. King, Major Hamilton Kirk, Captain W. J. Leyshon, Dr. J. McCunn, Mr. J. W. McIntosh, Professor W. C. Miller, Dr. F. C. Minett, Brigadier-General H. S. Mosley, Mr. W. Perryman, Miss K. M. Sanderson, Mr. G. W. Searles, Captain R. J. Stow, Mr. J. Steward, Dr. A. W. Stableforth, Mr. C. N. Thompson, Captain W. K. Townson, Miss O. Uvarov, Captain G. M. Vincent, Mr. F. W. Willett and Professor G. H. Wooldridge, together with the following visitors: Messrs. W. F. Barton, W. J. Carless, Miss D. H. Craddock, Miss M. Delavoy, Messrs. G. Greatorex, A. W. Hart, Miss M. T. Le Lacheur, Mr. J. W. G. Leiper, Miss S. F. Lowel, Mr. C. W. Ottaway, Miss M. R. Silverman, Mr. N. J. Scorgie, Miss B. Strong and Mr. E. Wallace.

The minutes of the December meeting of the Society, having received publication in *The Veterinary Record*, were taken as read and were confirmed on the proposition of Captain Stow, seconded by Major Kirk.

Correspondence.—(1) From Major-General Sir John Moore and Colonel Williams, apologising for their inability to attend.

(2) From Lieut.-Colonel B. L. Lake, submitting his resignation as a Fellow of the Society on the ground of his inability to attend the meetings. The Hon. Secretary informed the meeting that he had written to Colonel Lake requesting him to reconsider his decision, but that Colonel Lake had felt that he must adhere to it. The resignation was therefore accepted with regret.

(3) From Sir Frederick Hobday, acknowledging with thanks the expression of the sympathy of the Society which had been extended to Lady Hobday and to him in consequence of the serious accident which had recently befallen Lady Hobday.

(4) From the Royal Sanitary Institute, inviting the Society to send a delegate or delegates to the Health Congress of the Institute to be held at Southport.

It was unanimously agreed that a delegate be sent and that the Hon. Secretary, who had attended this Congress on the Society's behalf for a number of years, should again act as its representative.

(5) From the National Horse Association of Great Britain, seeking a renewal of the Society's donation of five guineas. This was approved.

(6) The Hon. Secretary reported the receipt of correspondence which had passed between him and Captain Smithers with reference to the proposed establishment of an R.S.P.C.A. clinic at Edgware; also with Mr. Flanagin, the Hon. Secretary of the Finchley, Golders Green and Hendon and District Branch of the R.S.P.C.A. with regard to the establishment of clinics by that Branch.

The President commented that he thought that the Secretary had dealt with that matter in a very efficient way and they could only wait until they heard further before deciding what additional action should be taken.

The President reported the receipt of a letter from a Fellow of the Society who was standing for election to the Royal College of Veterinary Surgeons and who was asking for their support. It had always been the practice of the Society not to give its public support to any members of the Society—mainly, he thought, because they were such a large Society that provincial people felt that to do so would be to give rather an undue advantage to their members. He would like to know, therefore, if it was their view that the Society should adhere to that custom in that instance.

It was unanimously agreed that the previous custom be adhered to, and the Hon. Secretary was instructed to send an explanation of the situation to the Fellow concerned.

Before proceeding further with the business of the meeting, the President said that he would like to mention that one of their members, Veterinary-Colonel G. Rees-Mogg, had been

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what of their natural calibre and action; and although the proper circulation may afterwards be a little disturbed, the fever will seldom rage again so high as it did; and, by and by, all settles down into the desirable and healthy condition of good fellowship, and hearty co-operation, and mutual esteem.

through a very serious operation and was now in a nursing home. Colonel Rees-Mogg was going on very well, he was glad to say, and was now out of danger. He thought, however, that it would be their wish that a letter should be sent expressive of the Society's sympathy with Colonel Rees-Mogg in his illness and of their earnest hope for his complete and speedy recovery. (Applause.)

Nominations.—The following nominations for Fellowship of the Society were made: Mr. W. F. Barton, 49, Warley Hill, Brentwood (proposer, Captain G. Dunlop Martin; seconder, Sir Frederick Hobday); Miss A. M. Beryl Copithorne, "Keri," Abbots Langley, Herts. (proposer, Major W. Denington; seconder, Mr. J. W. H. Holmes); Mr. J. Lowndes, 112, Valkyrie Road, Westcliff (proposer, Captain G. Dunlop Martin; seconder, Sir Frederick Hobday); and Mr. E. Wallace, West Hill, Highgate, N.6 (proposer, Captain W. J. Leyshon; seconder, Mr. J. W. H. Holmes).

Morbid Specimens and Cases of Interest.—Captain L. S. Balls said that he had there for the inspection of the Fellows the metatarsal of a racehorse. That horse was being walked through London and was struck by a motor-bus, sustaining very severe injury of the off hind fetlock, which was cut very deeply over a distance of about 8 in. After two or three days oil started to come from the wound, yet during all that time the horse fed, hanging in the slings, and had no temperature. That went on for six weeks, when the leg started to fill and his temperature went up. In the speaker's opinion the oil was coming from the tendon sheath because the horse fed and did not run a temperature and was very comfortable in the slings. When the temperature did go up, however, the horse was killed and on *post-mortem* the bones were boiled out, when it was found that the distal end of the metatarsal was chipped. He would like to hear the opinion of the Fellows as to whether, in their view, the oil was coming from the joint or from the tendon sheath.

Captain R. J. Stow exhibited a stone which had been removed from the ileum of an Airedale, saying that he thought that it was rather an interesting case. He saw that dog roughly a fortnight previously. It was vomiting and he formed the opinion that it was just an ordinary case of gastritis. The dog was passing nothing, however, and an enema only fetched away a small amount of hard fæces. With ordinary treatment the dog ceased to vomit and started to feed after two days. On the fourth day, however, he vomited again—a large quantity of very dark brown fœtid material. Two days after that he fed again and appeared normal, but two days later the vomiting recurred and so the case had gone on with alternating illness and improvement. That afternoon he had taken the dog to the Royal Veterinary College, where Professor McCunn made a diagnosis of stone in the bowel. The dog was operated on by Mr. Hickman, surgical assistant to Dr. McCunn, that afternoon, and there (exhibited) was the stone that was taken out. Mr. Hickman appeared to have performed the operation very successfully.

Mr. H. E. Bywater (Hon. Secretary) said that on the previous Sunday he was called to see a cow. The history was that this cow had been apparently normal first thing in the morning, when she was feeding, but that after breakfast the cowman could not get her up. She was a third-calved cow and had been served about five months previously, had passed the tuberculin test and appeared to be perfectly fit except that, according to the attendant, she seemed to have had some trouble in holding her water, while there had been some suspicion of occasional colicy pains. When he saw the animal she was down with her hind legs spread-eagled; consequently he diagnosed fracture of the pelvis and had the cow taken away. She was killed and on *post-mortem* examination the following were found: there was dislocation of the heads of both femora; rupture of both ligamenta teres; adhesion between the diaphragm and the anterior face of the liver and also the right kidney—apparently due to an injury from wire, because there was also a large abscess in the liver; the left kidney was full of Echinococcus cysts and there were cysts in the left kidney. He discovered a calf about the size of a small rat and putrid in the womb, which was full of pus. The animal, indeed, presented a veritable little museum.

Captain L. S. Balls enquired of Captain Stow if the dog stood with his front legs on the ground and his hind legs still erect, *i.e.*, in a "praying" attitude. He asked this because he had found this posture to be typical in cases of stone in the bowels.

Captain Stow replied that he had noticed nothing peculiar about the stance of the animal; it was very lively, in point of fact.

Proceeding, Captain Stow said that with regard to the case related by Mr. Bywater, he once had a rather valuable heifer which, when getting out of a railway truck, went down with a nasty sprawl. On *post-mortem* examination he found that the right hip joint was dislocated and that on the left side the acetabulum was broken and the hip joint on that side was out as well.

Dr. J. McCunn confirmed Captain Stow's statement (made in reply to a question by Captain Balls) that the dog which was the subject of the case recounted by Captain Stow looked particularly bright; it was wasted, but from casual observation one would not notice

anything wrong. The significant feature of the case was the fæcal vomiting; that symptom meant that either the dog had a depraved appetite or else that there was something obstructing one part or another of the bowel—it was not met with, however, when a foreign body was lodged in the colon.

Professor G. H. Wooldridge asked Captain Stow if he made a rectal examination, receiving the reply that such an examination had been carried out in this patient on three or four occasions, while Professor Wooldridge received a negative reply to his supplementary question if Captain Stow had noticed anything peculiar about the secretion from the rectal mucous membrane. His reason for asking that question, proceeded Professor Wooldridge, was the fact that in some cases under his observation there was a condition of the mucous membrane which facilitated diagnosis. In cases where the obstructing body was in the upper part of the intestine the rectal mucous membrane had a sticky feel, and as one withdrew one's finger it was covered with a thick, catarrhal material, with shreds of mucus. One could then hazard a pretty good guess that there was an obstruction. If the obstruction had got down to the colon the rectum was more frequently dilated and one would not get the same sticky feel of the mucous membrane; when it had reached there, however, one could generally feel it.

In reference to these cases, he might again emphasise how frequently some dogs would swallow those foreign bodies. At the College they had an Airedale, discharged just recently, which belonged to a licensee and which, a year previously, had swallowed one of the metal caps from an ærated water bottle. As it had been there for a long time, the bowel was in a very necrotic condition, and there was great difficulty in getting the sutures to remain in. The dog, however, recovered. He was brought back again only last month, and the owner said he was showing the same symptoms as on the former occasion. Palpation on this occasion revealed a foreign body, diagnosis was confirmed by X-ray, a laparotomy was performed, and again the animal made a good recovery. Both operations were performed by Mr. Formston.

Concluding, Professor Wooldridge observed that the only comment he would make on Mr. Bywater's case was to compliment him on his humane action in destroying an animal with which so much was wrong. (Laughter.)

The Hon. Secretary supplemented his earlier observations by saying that the cysts were not actually in the substance of the bladder, they were adherent to the mucous membrane. Echinococcus cysts normally appeared in the substance of the organ.

Paper.—There being no further discussion on the morbid specimens and cases of interest, the President called upon Professor Miller to read his paper, the title of which had been amended, from that appearing on the agenda, to read: "Low Temperature Blood Meals as a Source of Essential Amino-acids for Nutritive Purposes." The discussion, which was well sustained, considering the specialised nature of the subject, was ably opened by Professor Wooldridge. [Professor Miller's paper and a report of the discussion and of the essayist's reply, are reproduced at the commencement of this issue.—*Editor.*]

Votes of Thanks.—The President said that he would like to propose to Professor Miller, from the Chair, a hearty vote of thanks, not only for his excellent paper but for the very careful and conscientious way in which he had replied to the discussion. He thought it was a very long time since he had heard an essayist reply so meticulously and so fully. (Hear hear.)

The vote of thanks was carried with acclamation and the meeting terminated with the payment of similar tributes to those who had brought *post-mortem* exhibits or related cases of interest, and to the President for his conduct of the proceedings.

H. E. Bywater, *Hon. Secretary.*

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NORTH MIDLAND V.M.A.

ANNUAL GENERAL MEETING AT SHEFFIELD*

The Annual General Meeting of the above Division was held at the King's Head Hotel, Change Alley, Sheffield, on December 12th, 1935.

The President, Mr. E. Marrison, occupied the chair and the following members were also present: Captain E. F. Angler, Messrs. F. H. Addison, D. D. Canning, W. Collinson, R. Hudson, Major Green, Messrs. P. M. Evershed, T. C. Fletcher, H. Thompson, J. S. S. Woodrow, H. M. Salusbury and F. C. Scott. Messrs. W. J. Guthrie and S. Jamieson were present as visitors.

Apologies for unavoidable absence were received from Messrs. Brennan and Murgatroyd.

The minutes of the last meeting, which had been published in *The Veterinary Record*, were confirmed.

Election of Officers

Officers for the ensuing year were elected as follows:—

President.—Mr. E. Marrison.

Vice-Presidents.—Messrs. S. H. Nixon and A. Walker.

Hon. Treasurer.—Mr. H. Thompson.

Auditors.—Messrs. D. D. Canning and T. C. Fletcher.

*Received for publication January 11th, 1936: insertion unavoidably delayed.

Council.—Mr. F. H. Addison, Captain Angler, Messrs. W. Collinson, T. Bowett, Major Green and Mr. R. Hudson.

Hon. Secretary.—Mr. H. M. Salusbury.

Correspondence: *Payment of Expenses Incurred by Branch and Divisional Representatives.*—It was agreed that part payment of expenses should be paid by the Division to their representatives when attending Committee and Council meetings of the parent body in London.

It was resolved that one guinea be sent to the National Horse Association and two guineas to the Victoria Veterinary Benevolent Fund.

Discussion: After the usual routine business, the President called on Mr. R. Hudson, F.R.C.V.S., Retford, to open a discussion on "Some Modern Drugs and Treatments."

Exhibits.—Before reading his paper, Mr. Hudson exhibited a very simple and useful apparatus for the giving of intravenous injections in the larger domestic animals. In addition, Mr. Hudson produced an interesting *post-mortem* specimen of impaction of the ileum at the ileo-cæcal valve in the horse, which was also dealt with by him in his address.

Vote of Thanks.—The President, in moving a vote of thanks to Mr. Hudson, described the meeting as one of the best they had had. The subject so ably introduced by Mr. Hudson had raised a very interesting and instructive discussion of four hours' duration. [A full abstract of Mr. Hudson's address, and a report of the discussion upon it, are reproduced earlier in this issue. Mr. Hudson's account of impaction at the ileo-cæcal valve in the horse is given in the February, 1936, issue of *The Veterinary Journal* (**92**, 2, 50-52).—*Editor.*]

A vote of thanks to the President terminated the proceedings.

H. M. Salusbury, *Hon. Secretary.*

In Parliament

The following questions and answers have been recorded in the House of Commons recently:—

Foot-and-Mouth Disease (Chilled Meat)

Brigadier-General Clifton Brown asked the Minister of Agriculture whether in view of the fact that the virus of foot-and-mouth disease survives in chilled meat and that this disease is distributed by the use of bones imported in chilled meat, the Government are taking any action to prevent the importation of meat which may carry the virus from any country in which this disease prevails?

Mr. Elliot: So far as I am aware, there is no evidence to support my hon. and gallant Friend's statement that foot-and-mouth disease is distributed by the use of bones imported in chilled meat, but I recognise that there is some such risk. Regulations governing the exportation of carcases to this country have been in force in the South American meat exporting countries since 1928 and assurances were given as recently as last year by the Governments concerned that these regulations are being properly enforced. In addition, Orders are in force in this country directed to preventing the spread of disease through pig food and meat wrappers, and other similar material.

Mr. Boothby: Do these Regulations and Orders apply to Scotland as well as England?

Mr. Elliot: Yes, Sir.

Brigadier-General Brown: Although the right hon. Gentleman says that it is not the case that foot-and-mouth disease is spread in the manner suggested, is research into the question going on at the present time?

Mr. Elliot: Yes, there is a good deal of research carried on by the Foot-and-Mouth Disease Committee.

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The Milk Bill

In the House of Lords, on Tuesday last, Earl de la Warr, Parliamentary Secretary to the Board of Education, moved the second reading of the Milk (Extension of Temporary Provisions) Bill, which extends for 18 months, and amends, the Milk Act, 1934. He said it was hoped that at the end of 18 months the Government's long-term policy would be completed.

Viscount Astor paid a tribute to the pioneering work which had been done by Lord De La Warr in developing the policy for the improvement of nutrition. While it was unlikely that there would be a spectacular increase in the consumption of milk as a result of the supply of cheap milk in the schools, he hoped there would be a steady increase. Unless the price of milk to the consumer was lowered very substantially, there would not be the full consumption of milk which was desired. Something should be done to reduce the price by reducing the cost of distribution and the cost of production and by subsidy.

Lord Eltisley said that the Bill was vitally necessary till the long-term policy was in force. He regretted that provision was not made for extension of the milk in schools scheme.

The Bill was read a second time.

Mr. J. F. Blackshaw, vice-chairman of the Farmers' Club, speaking at a meeting of that body held in London on March 2nd, said that the present official regulations were not sufficient to enable the industry to carry on a successful drive against the spread of disease. He urged that the industry should seek to agree upon the additional powers that are needed; and furthermore that farmers acting jointly should seriously undertake the enforcement of discipline within their ranks in the observation of rules designed to restrict the spread of disease. The disciplinary body might, it was suggested, act through area or county committees, who would be supplied by the local authorities with copies of the reports of their officers respecting diseases on farms.

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On Tuesday, March 17th, at 8 p.m., an interesting public lecture entitled "The Songs of Birds" will be given at Birkbeck College, Bream's Buildings, London E.C.4., under the auspices of the University of London Animal Welfare Society. Professor Walter Garstang, of the University of Leeds, will be the lecturer and will illustrate his remarks by gramophone and other instruments. Admission is free, without ticket.

Notes and News

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Mar. 16th.—Meeting of the Editorial Committee, N.V.M.A., at 2, Verulam Buildings, Gray's Inn, W.C.1, 4 p.m.

Mar. 17th.—University of Liverpool, School of Veterinary Science, Dinner and Dance, Reece's Restaurant, Parker Street, Liverpool.

Mar. 18th.—Annual General Meeting of the Western Counties Division, N.V.M.A., at Exeter, 2 p.m.

Mar. 20th.—Meeting of the South Wales Division, N.V.M.A., at Swansea, 2.30 p.m.

Mar. 26th.—Annual General Meeting of the Southern Counties Division, N.V.M.A., at Salisbury, 2.30 p.m.

Mar. 30th.—N.V.M.A. Committee Meetings.

Mar. 31st.—N.V.M.A. Council and Committee Meetings.

April 1st.—R.C.V.S. Annual Fee due.
R.C.V.S. Committee Meetings.

April 2nd.—R.C.V.S. Committee Meetings.

April 3rd.—R.C.V.S. Committee and Council Meetings.

May 7th.—Last day for nominations for election to R.C.V.S. Council.

May 21st.—Voting Papers issued, R.C.V.S. Council Election.

May 28th.—R.C.V.S. Council Election Voting Papers due.

June 4th.—R.C.V.S. Annual Meeting and Luncheon in Edinburgh.

June 11th.—D.V.S.M. Examination begins.

June 24th.—R.C.V.S. Committee Meetings.

June 25th.—R.C.V.S. Committee Meetings.

June 26th.—R.C.V.S. Committee and Council Meetings.

June 29th.—R.C.V.S. Membership Examinations begin.

Sept. 14th-18th.—N.V.M.A. Annual Congress, Scarborough.

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PERSONAL

Appointment.—Mr. D. Trefor Roberts, M R.C.V.S., son of Mr. G. Jones Roberts, Pwllheli county veterinary surgeon, has been appointed veterinary inspector under the Ministry of Agriculture for Northern Ireland and will be stationed at Belfast.

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On Leave.—Mr. W. G. Beaton, M.R.C.V.S., Veterinary Research Officer, Bukuru, N. Nigeria, and Mr. R. Dunwoody, M.R.C.V.S., Veterinary Department, Sokoto, N. Nigeria, have arrived in this country on leave.

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Presentation to Captain Gillard.—"Captain Gillard has been our hon. veterinary surgeon since the Society was formed in 1932. He has always given us every consideration, and in recognition of his services and assistance to the Society we are giving him this little gift as a token of our appreciation," said the Hon. Secretary of the Folkestone Canine Society, in presenting a chromium cigarette lighter to Captain F. C. Gillard, M.C., F.R.C.V.S., at the Winter Gardens of the Royal Pavilion Hotel, Folkestone, on February 21st.

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R.C.V.S. OBITUARY

Cartwright, John Edwin, Skinner Street, Wolverhampton. Graduated London, April 11th, 1888; died March 4th, 1936, aged 68 years.

Mr. Cartwright, who was the son of a Bilston bank manager, was a familiar figure not in Wolverhampton only, but in many parts of South Staffordshire and Shropshire. He had practised as a veterinary surgeon in Wolverhampton and district for 46 years, and he was associated in a professional capacity with the Health Department of Wolverhampton Corporation, Bilston Council, and Dunstall Park Racecourse Company, Ltd.

For many years Mr. Cartwright had been a member of the Lodge of Honour of Freemasons (526) of which he was a Past Master.

He had at his command a fund of good stories of events and experiences during nearly a half century of a veterinary surgeon's practice.

Mr. Cartwright leaves a widow, one son, and three daughters.

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Mitchell, George Marshall, Abbeygate, Beechwood Street, Sunderland. Graduated Edinburgh, April 16th, 1879; died March 7th, 1936, aged 77 years.

Mr. Mitchell, who was a very well-known veterinary surgeon on Wearside, was a native of Haddington, was educated at Edinburgh, also gaining his diploma at the Veterinary College there, and had been in private practice in Sunderland for more than 50 years. He was a past president of the North of England Veterinary Medical Association.

Mr. George Mitchell was the father of Professor William McGregor Mitchell, of the Royal (Dick) Veterinary College, Edinburgh, and of Captain Thos. M. Mitchell, M.R.C.V.S., of Sunderland.

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The Late Mr. Luther Jones

In the death of Mr. William Luther Jones, M.R.C.V.S., of Apothecaries' Hall, Menai Bridge, Anglesey, which we announced last week, the district in which he lived has sustained a severe loss. Educated at Bala, Mr. Jones went to Edinburgh Veterinary College, where he had a brilliant career, and became a gold medallist. Returning to his native county, he commenced practice on his own account. He was a valued member of the Menai Bridge U.D.C. for over 30 years, and had filled the Chair with conspicuous success; he was also a keen yachtsman. Mr. Jones had been ill for some months, and leaves a widow, a son, and a daughter.

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The Late Mr. Frank Warren

"Through the death in the Kent and Sussex Hospital, Tunbridge Wells, of Mr. Frank Warren, F.R.C.V.S., Hadlow has lost an old and respected resident," says the *Kent Messenger.*

Mr. Warren, whose death was recorded in our issue of February 29th, was a member of an old Hadlow family. For about 30 years he practised in the village and district, and for several years

acted as honorary veterinary surgeon to the local branch of the R.S.P.C.A.

After his retirement in 1916 he lived in Tunbridge Wells for about seven years and in time became a member of the Calverley Bowling Club. On his return to Hadlow he frequently played for the Tonbridge Bowls Club. Hunting and fishing were also favourite pastimes of his. He leaves a widow and three daughters.

The funeral took place at Hadlow Cemetery, when the mourners included Mrs. Warren (widow), and Captain and Mrs. J. F. Macdonald (son-in-law and daughter), while many other friends and members of the veterinary profession were present.

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Vessey William, Southfield House, Howard Road, Southampton. Graduated London, April 1st, 1875; died February 17th, 1936, aged 84 years.

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R.S.P.C.A. SILVER STAR (ABYSSINIAN) VETERINARY UNIT

Before leaving for Abyssinia in charge of the Veterinary Unit sent out by the R.S.P.C.A. for the relief of suffering war animals, Colonel R. J. Stordy—who should now have reached Addis Ababa, the destination of the Unit—assured us of his readiness to recount his experiences in the *Record* in due course. We learn that Colonel Stordy has two assistants with him, Mr. G. Latham and Mr. J. S. Lloyd, who have had wide experience in the East of animals used for military purposes; what native personnel he will require will be engaged in Abyssinia.

Colonel Stordy took with him letters of introduction to the British Minister to the Ethiopian Court, to the British Consul at Addis Ababa, to the Abyssinian Foreign Minister, to the President and Hon. Secretary of the Addis Ababa S.P.C.A., and to other sources likely to facilitate the work of the Unit.

The equipment dispatched was on the scale recommended by the War Office for a field hospital for one year for 250 animals. The goods sent include surgical instruments, line gear, a fully equipped office, quartermaster's stores, tents, food-stuffs, bandages, medicines and drugs, including drugs for local and general anæsthesia, a supply of humane killers, and 10,000 rounds of blank cartridges for their use.

The equipment was put on board the Japanese vessel the *Terukuni Maru*, at the Royal Albert Docks, on February 6th, and was landed at Port Said for transhipment to the *André Lebon* of the Messageries Maritime service. Colonel Stordy and his assistants arranged to join the *André Lebon* at Marseilles.

Shortly before his departure from London Colonel Stordy was received by Dr. Martin, the Ethiopian Minister, who expressed his keen interest in the work.

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LEGAL NOTES

Fines amounting to £20 on four summonses were inflicted on a Bath licensed slaughterman for having in his possession diseased meat, for refusing to give information respecting the meat, and for failing to give notice of slaughtering in two cases.

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At the Glamorgan Assizes at Cardiff, John Walter Jones, a smallholder and farmer, of Ystalyfera, near Swansea, was found guilty on five charges of stealing sheep from farmers in the Swansea Valley, and was sentenced to six months' imprisonment.

GERMAN ARMY VETERINARY ACADEMY RE-ESTABLISHED

An Exchange message states that the Army Veterinary Academy formerly in Berlin, closed down under the Versailles Treaty, after an existence of 70 years, has now been re-established. It has, however, been transferred from Berlin to Hanover, where it was formally inaugurated in the presence of General Beck, Chief of the General Staff.

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ARMY VETERINARY SERVICE

Brigadier H. C. Dibben succeeded Brigadier H. S. Mosley, D.S.O., as Director of Veterinary Services in India on February 3rd. The following officers have proceeded to India for a tour of duty: Major B. J. W. Nicholas on February 7th; Major W. B. Howe, from Egypt on February 15th; and Lieutenants A. D. Seton, R. H. Duff and E. H. Lewis Bowen, on February 27th.

Major P. Howard was posted from Portsmouth to Bulford for duty on February 3rd, Major F. J. Weir from Newcastle to Edinburgh on February 25th, and Captain I. D. Macrae from Edinburgh to Shorncliffe on February 28th.

Major J. S. Keane is at present on leave in this country from India, and Major J. Leigh, who has been on leave ex India, will join at Aldershot for duty on March 29th. Major J. Mullany has returned to this country from China and is at present on sick leave until July 3rd next.

The following retired officers have been re-employed for temporary duty:—Lieut.-Colonel F. C. O'Rorke, C.M.G., F.R.C.V.S., Major H. Bone, M.C., and Major F. Wallace; at Portsmouth, Newcastle-on-Tyne, and Hounslow, respectively.

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RELATIONSHIPS IN THE SEX HORMONE GROUPS

The following article, by Professor L. Ruzicke of Zurich, on the subject of "Relationships in the Sex Hormone Groups," which appeared in *Nature*, February 15th, will be of particular interest to veterinary workers on account of its bearing upon sterility and other problems. (A list of 13 references is given in the original, in which the chemical structure of hormone-containing substances is represented diagrammatically.)

"The sex hormones may be divided into two main classes. One class comprises the gonadotropic hormones, the chemical structure of which is still unknown, and which stimulate the gonads to the production of the real sex hormones. It is possible that the gonadotropic hormones are identical in both sexes. However, the occurrence of the real male and female hormones, which form the subject of this article, is also not specific for the sexes, since it has been proved by their action that hormones of the other sex can exist in the male as well as in the female organism. A female hormone has been successfully isolated in a pure state even from the urine of stallions. The specific action of the male and female hormones is confined only to the development and maintenance of the functions of the sex organs and glands and the secondary characteristics of the sex under consideration. This, however, by no means excludes the possibility that both groups of hormones can play a definite biological part in both sexes. Lately, a substance, androstene-3, 17-diol, was prepared artificially, which showed even male and female hormone activities.

"The sex hormones afford one of the best examples of how Nature, in using a fundamental

principle, can produce not only different but even contrary actions by an alteration in the details of this fundamental principle. The common characteristic of all sex hormones is that they can be derived from cholesterol (1) by splitting off a part of the side-chains, and thus they all contain a ring system consisting of four carbon rings. The difference between the individual hormones depends upon which part of the side-chains has been split off, and is, moreover, essentially due to the variation in hydrogen content.

"On account of their schematic structure, the work of determining the constitution of the sex hormones has been very considerably facilitated. Once the empirical formula has been determined and the groups present in the molecule identified, the correct molecular structure of a newly isolated hormone could be guessed by considering how such a compound could be most simply derived from cholesterol. It will be of interest to trace briefly these relationships in the individual groups of sex hormones.

"The œstrane group comprises the female sex hormones, with the exception of progesterone, and is characterised by the presence of 18 carbon atoms in the molecule. One of the most important points in the elucidation of the constitution of this group was the conversion into a phenolic dicarboxylic acid, and from this it could be supposed that the hydroxylated ring in œstrone is a benzene ring, the presence of which also affords an explanation for the splitting of one methyl group from cholesterol in the formation of this hormone group. Œstradiol could be obtained by reduction from œstrone, and œstriol may be transformed into œstrone by the removal of water. The formula (given) for equilenin is the simplest expression for a naphthol derivative in this group, and except for the position of the fourth double bond, the constitution of equilin is established. In addition, all the details of the structure of the œstrane group are established by chemical reactions and only the steric structure remains in doubt, although this is very probably identical with that of cholesterol.

"The fact that progesterone is an unsaturated diketone with the empirical formula $C_{21}H_{30}O_2$ led to the proposal of a formula which could be verified by an artificial preparation of progesterone which had stigmasterol as its starting material.

"A similar relationship was found to exist in the first two male sex hormones, which were isolated by A. Butenandt in a pure state from urine, and are characterised by the presence of 19 carbon atoms. From the empirical formula of androsterone it was supposed that it is related to a hydrogenated sterol. The details of the structure of this hormone were definitely settled by its artificial production from epicholestanol. The similar preparation from cholesterol of the other male hormone present in urine showed it to be androstene-3-ol-17-one.

The ready accessibility of androsterone rendered possible thorough physiological investigations, which soon proved that androsterone could not be identical with the male hormone from testes. In the first place, the highly purified testicular extract was considerably superior to androsterone in its action on the sexual glands of castrated rats; secondly, definite chemical properties of the active substance from testes pointed to a different molecular structure from that of androsterone. The physiological action of the testicular extract was destroyed by alkali and by potassium permanganate under the very conditions which left androsterone unattacked. This fact led to the correct view as to the structure of the testicular hormone even before the hormone itself had been isolated in a pure state. The instability towards alkalis was the chief reason for our view that an α, β-unsaturated ketonic group is present in the testicular hormone, since such compounds are, as a rule, less stable towards alkalis than the corresponding saturated ketones. In the androstane group, the simplest α, β-unsaturated ketonic compounds which can be derived from cholesterol are androstene-3, 17-dione, and androstene-3-one-17-ol, and accordingly these suggest themselves as possible formulæ for the testicular hormone.

"The first test of this hypothesis was made possible by the physiological examination of the androstene-dione prepared from cholesterol. The properties of this diketone corresponded, although not completely, yet in essential features with those of testicular extract, and therefore as a further test it was necessary to carry out the artificial preparation of testosterone. At this point our synthetic method for the elucidation of the testicular hormone happened to coincide with the analytical method of Laqueur and his co-workers. These workers had meanwhile succeeded in isolating the pure hormone from testes; it was named testosterone, and was different from our diketone. The similarity in physiological action between the diketone and testosterone, however, afforded a means of testing whether the second of the two formulæ proposed for the testicular homone, that of androstene-3-one-17-ol, should not be given consideration. Indeed, testosterone yielded androstene-dione on oxidation and the androstene-3-one-17-ol prepared from cholesterol by suitable methods was identical in all its properties with natural testosterone. This hormone is about 20-25 times more powerful than androsterone in its action on the sexual glands, for example, the seminal vesicles, the prostate and Cowper's glands; its male hormone action exceeds that of any compound as yet isolated from an organism.

"However, in spite of this, the whole problem of the male hormone action of testicular extract is not yet completely solved, since according to Laqueur and his co-workers testicular extract contains as well as the hormone a constituent—the so-called X substance—which is by itself inactive but the presence of which markedly increases the characteristic action of testosterone.

"The recognition of the fact that α, β-unsaturated ketonic compounds are responsible for male hormone action offers a plausible explanation for the origin from cholesterol of the sexual hormones of the œstrane and androstane groups present in organisms. Androstene-3, 17-dione may be assumed to act as an intermediate product, although it has not yet been detected in Nature, as by hydrogenation of the double bond and one ketonic group it could be converted into androsterone; in this way it also provides an explanation for the epi-position of the hydroxyl group in the latter. Moreover, œstrone might be produced by the removal of methane from androstene-dione. In the same manner œstradiol, the most powerful female hormone which was isolated by E. A. Doisy from the ovary, could be derived from testosterone, the most powerful male hormone. Finally, the testosterone in organisms might also have its origin in a partial hydrogenation of androstene-dione. Thus a possible explanation is obtained for the simultaneous occurrence of the male and female hormones in one organism.

"The appearance of different hormones with similar action in organisms leads to the question

of the relationship between their constitution and physiological action, and, furthermore, to the question of the chemical specificity of hormone action. The specificity is most evident in progesterone, which as yet is the only compound possessing the complete characteristic corpus luteum hormone action. The specificity of the hormones in the œstrane group is no doubt considerably smaller, as they all show approximately the same qualitative action, the main point of difference being merely a quantitative one. In all the hormones of the œstrane group the phenolic ring is present unchanged, whereas in contrast, this ring in the androstane group is variable, and this group of hormones is accordingly characterised by the largest number of compounds which, in spite of differences in chemical structure, yet show very similar physiological action.

"The formulæ (iii-vi) give only a partial indication of the possible variations in the androstane group. We have recently discussed more than twenty physiologically active androstane derivatives in which relationships between constitution and action can be undoubtedly recognised. These investigations involved the preparation of the 17-methyl-testosterone, which according to preliminary results seems to show an activity on the sex glands of castrated rats slightly higher even than that of testosterone. In different laboratories and medical research institutes, the most powerful of these compounds, especially testosterone, have been subjected to a thorough investigation, which should provide the answer to the question as to range of the physiological action of the male hormones in healthy and diseased organisms."

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ŒSTRIN AND CANCER

"No branch of biological science shows such rapid progress as the study of sex hormones, and unlike advances in our knowledge of other series of pharmacologically active substances, this progress has covered all the aspects of the subject—physiological, pathological, and chemical," states a *Lancet* annotation (February 8th). "There is little doubt that the original stimulus for the work now developing so successfully was the observations of Allen and Doisy, some twelve years ago, which put research on the ovarian hormone on a sound experimental basis. A second great stimulus came through Aschheim and Zondek's recognition of œstrus-producing hormone and prolan in the urine. A year or so later, crystallisation of the former led to the foundation of the accurate chemical investigations in which so many have taken an active and important part.

Some of the most surprising results of this work concern the chemical relationships of the œstrus-producing hormones. Their recognition as derivatives of the sterol series has linked them up with vitamin D on the one hand and such substances as the cardiac aglucones on the other, and it is only natural that this chemical relationship should lead to speculation about the possibility of sex hormones having other actions besides the main one. It has been shown, for example, that many of the male hormone derivatives are œstrogenic, and Zondek's discovery of the œstrus-promoting factor in the urine of stallions indicates the complexity of the physiological activity of these bodies. The further observation that certain carcinogenic substances are also œstrogenic raises the question whether there is some relation between œstrin and malignant disease—a question of more than academic importance now that œstrin in substantial doses is widely used in medical practice. It has been claimed by a number of workers, particularly by Lacassagne, that it is possible to increase the incidence of mammary carcinoma by administration of œstrin, and it has also been pointed out that administration of very large quantities of œstrin will bring about changes in the epithelium of the genital tract of a type which suggest malignant proliferation, although no epitheliomata have been reported. Fortunately, however, we have the clear-cut demonstration, by E. L. Kennaway and his co-workers,[1] that œstrin, when painted on the skin of mice according to the standard technique employed by the Cancer Hospital workers in testing for carcinogenic properties, was entirely without effect. From this it appears that œstrin is not carcinogenic in the same way as 1: 2: 5: 6-dibenzanthracene or methylcholanthrene are carcinogenic. It must be remembered also that the animals in which Lacassagne produced carcinoma of the breast were of inbred stock, selected for susceptibility to cancer, and that the conditions were therefore very different from those of administration of œstrin to human beings. Moreover, as Dr. Cramer and Dr. Horning pointed out in our last issue, all these experiments, including their own, involve the treatment of animals with large quantities of œstrin over a very long period, and here again the conditions do not resemble those of clinical practice.

"In reviewing the relationship of sex hormones, carcinogenic hydrocarbons, and synthetic œstrogenic agents, Prof. E. C. Dodds[2] has lately remarked that the similarity, in chemical structure, between carcinogenic hydrocarbons and œstrin is by no means so close as the similarity between the male and female sex hormones; yet there has never been any suggestion that the treatment of women with large doses of œstrin is likely to lead to masculinisation effects."

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THE LIVER PRINCIPLE ACTIVE IN PERNICIOUS ANÆMIA

The discovery of a liver principle active in the treatment of pernicious anæmia is one of the greatest recent triumphs in human therapeutics, and although our animals do not suffer obviously from a similar disease, we believe that the statement of recent advancements by a worker of high authority will be appreciated. Accordingly, the following article by Dr. Charles C. Ungley, Leverhulme Scholar of the Royal College of Physicians, on the subject (in which an extensive list of references is also given) is reproduced from *Nature*, February 8th.

"The past decade has seen a complete change in our conception of the ætiology of pernicious anæmia: formerly attributed to hæmolytic toxins, it is now regarded as a nutritional disorder. In 1926 Minot, Murphy and their co-workers demonstrated that liver was effective in pernicious anæmia and that the hæmopoietic response was quantitatively related to the amount of material administered. Following the bone marrow studies of Peabody, it appeared that a substance contained in liver allowed the maturation of megaloblasts to normoblasts and thus to adult red blood cells.

"The true significance of the achlorhydria associated with pernicious anæmia soon became apparent. Fenwick in 1880 had observed the atrophic condition of the stomach in pernicious anæmia and noted the inability of the gastric juice to digest protein, but his conception of the disease as a nutritional disorder was lost sight of in an age when 'toxic theories' were in vogue. The classical experiments of Castle and his fellow workers have shown that pernicious anæmia is

[1] *Proc. Roy. Soc.*, B., 1935, cxvii., 318.

[2] *Ergeb. d. Physiol. u. exp. Pharm.*, 1935, xxxvii., 264.

a conditioned deficiency, based on a gastric defect. Material effective for blood regeneration in pernicious anæmia arises from the interaction of an intrinsic (gastric) factor present in normal gastric juice and an extrinsic (food) factor. The material which results from this interaction is absorbed from the intestine and stored in the liver and other organs.

"Addisonian pernicious anæmia results from a deficiency of the gastric factor, but the syndrome of nutritional macrocytic anæmia may arise in other ways. Thus a diet deficient in the extrinsic factor is a chief ætiological factor of the tropical macrocytic anæmias. Deficient absorption of preformed hæmopoietic material from the intestine or its destruction therein may contribute to the production of the macrocytic anæmia found in some cases of sprue, intestinal stricture, and multiple intestinal anastomoses. In pregnancy a latent partial deficiency may become manifest owing to the demand of the fœtus for hæmopoietic material. Defective storage of hæmopoietic material in the liver may account for the macrocytic anæmia sometimes found in hepatic cirrhosis.

"The extrinsic factor is soluble in water and in 80 per cent. alcohol, and is not destroyed by heating at 120°C. for five hours. It is present in muscle meat, wheat germ, rice polishings, eggs and possibly tomatoes. Liver and liver extract contain, in addition to fully formed active principle, a considerable amount of the extrinsic factor. Marmite (vegex), an extract derived from autolysed yeast, is a rich source of extrinsic factor, but dried yeast is apparently inactive in this respect. Ungley and James observed reticulocyte responses in some cases receiving alcoholic extracts of non-autolysed yeast as a source of extrinsic factor, and found that autolysis did not lead to noticeable increase in hæmopoietic effect. Groen finds that autolysis alone does not produce the factor, but has obtained positive results in four out of five cases with an extract of brewer's yeast, which after being autolysed by the addition of HCl and NaCl was heated in the autoclave. He suggests that extrinsic factor may arise from the hydrolysis of yeast proteins occurring at a high temperature in an acid medium. Strauss and Castle originally suggested that the extrinsic factor might be vitamin B_4, but other workers have been unable to identify it with any known portion of the vitamin B complex.

"The gastric or intrinsic factor is a heat-labile substance extracted with difficulty from stomach tissue and is associated with the protein fraction of stomach press juice. According to Klein and Wilkinson, who call the substance hæmopoietin, it is probably a protein and is possibly enzyme-like in nature. Desiccated stomach, which probably contains a mixture of intrinsic and extrinsic factors, is effective in daily doses of 30 gm. derived from about 200 gm. of fresh tissue. Wilkinson has obtained fractions effective in doses of 5 gm. daily. The work of Meulengracht suggests that in the pig the formation of the gastric factor takes place in the pyloric gland region, and also in the glands of Brunner in the duodenum, which are morphologically similar. On the other hand, the production of hydrochloric acid and pepsin is confined to the corpus region (Swedish terminology: fundus region) with its oxyntic and chief cells, this region being hæmopoietically inactive.

"The site of interaction of the intrinsic and extrinsic factors is unknown, but Castle suggests that at least one stage of the process of formation of the end-product active on the bone marrow takes place in the gastro-intestinal tract presumably at or near neutrality. *In vitro* the resultant of this interaction is destroyed by heating to 70° to 80°C. for an hour or by boiling for five minutes. The synthesis of a thermostable product identical with the liver active principle has yet to be accomplished.

"Cohn, Minot and their co-workers obtained liver extracts active intravenously in doses as small as 0·025 gm. daily, but the earlier methods were not practicable for general use because of the large amounts of active material lost or destroyed in the process of fractionation. Using simpler procedures, Gänsslen and Castle produced extracts which were effective parenterally in daily amounts derived from 5 to 20 gm. of liver. Given by injection, the extracts were 30 to 100 times more effective than when administered orally. Attempts to isolate the liver factor have been hampered by the fact that the product is easily inactivated by chemical processes, and by the lack of a reliable non-clinical test for activity. Early steps were the removal of inert protein by coagulation with heat or alcohol and the precipitation of active material from the filtrate by phosphotungstic acid.

"The product obtained from commercial liver extract by Dakin and West is of interest in view of its relative constancy of composition, the isolation of crystalline products of hydrolysis, and the apparent fact that clinical potency is constantly associated with the compound and is absent from preparations in which it has been either removed or chemically altered. Preliminary purification of the commercial liver extract was effected with calcium acetate in 75 or 80 per cent. alcoholic solution. Thereafter almost the whole of the active material could be precipitated from the filtrate with Reinecke salt in acid solution. After decomposing the Reineckate the active material was repeatedly salted out with ammonium sulphate and afterwards with magnesium sulphate. Further fractionation was carried out with the aid of sodium chloride. The clinically potent products were light buff coloured granular powders, the yield being approximately 1 per cent. of the dry liver extract. Intravenously, doses of 75 mgm. have produced maximal reticulocyte responses. The material was soluble in water and dilute alcohol but insoluble in absolute alcohol and in ether. Hydrolysis yielded an aminohexose and a number of amino-acids, namely, lysine, arginine, glycine, leucine, hydroxyproline, and aspartic acid. Pyrimidine or purine bases were absent. The substance was slowly decomposed by pepsin and more rapidly by erepsin. Pancreatic juice had no effect.

"In pernicious anæmia during relapse, red marrow largely replaces the fatty tissue in the shafts of the long bones, the hyperplastic marrow being characterised by the presence of numerous megaloblasts. During remission the megoloblasts disappear and the bone marrow reverts to normal type. It seems that the liver principle aids the maturation of megaloblasts to normoblasts and thus to erythrocytes. At first many of the newly formed red blood cells escape into the circulation in a state of immaturity as reticulated cells. These reticulocytes, which usually number less than 2 per cent. before treatment, begin to increase rapidly about four days after the commencement of liver administration and reach a peak on the seventh to the tenth day. Up to a point the height of the reticulocyte response increases with the amount of active material administered, but even with maximal amounts the height of the peak is inversely proportional to the initial red blood cell count. From a red cell level of one million a peak of

more than 40 per cent. may be expected, whereas with a level of two-and-a-half millions the expected maximum is not more than 15 per cent. When an adequate dose of liver extract is injected intravenously the rise of reticulocytes occurs earlier and reaches a higher level than when maximal doses of material are given daily by mouth.

"The amount of material required to produce a maximal reticulocyte response or a maximal rate of increase of red cells, or to maintain a normal red blood cell level, is subject to marked individual variations and is influenced by factors such as age, arteriosclerosis and infections. There is thus no fixed dose, and each patient must be given sufficient material to suit his individual needs. The danger of over-dosage is negligible; even when very large amounts are administered parenterally over long periods of time the red blood cell count and hæmoglobin value rarely go much above the normal limits. During the reticulocyte crisis there is a marked increase in the urinary excretion of uric acid, possibly due to disintegration of red cell nuclei. Leucopenia disappears and the platelet count becomes normal. As the blood picture improves, the low protein and cholesterol values in the serum return to normal. Bilirubinæmia is abolished and the increased excretion of urobilin in fæces and urine ceases. Siderosis of the organs disappears, and indeed the rapid output of new red cells may exhaust the iron stores of the body, so that the colour index falls below unity, and a return to a normal blood picture is delayed. This can be overcome by the administration of iron.

"During the remission there is a rapid increase of body weight due to fluid retention and to increased caloric intake. The basal metabolic rate returns to normal or subnormal levels as the anæmia disappears. Soreness of the tongue usually disappears during the first week of treatment. Regeneration of the atrophic lingual papillæ occurs in some cases. In the early stages of treatment, before the red blood cell count has risen significantly, there is a feeling of well-being and a return of appetite. At the same time there is a pink coloration of the face and extremities associated with dilatation of the skin capillaries. Gastro-intestinal symptoms such as flatulence, epigastric discomfort or pain, vomiting or diarrhœa frequently clear up during a liver-induced remission. In some cases, however, the administration of hydrochloric acid and pepsin is necessary to produce this result. The gastric defect which underlies the syndrome and which is accompanied by achlorhydria persists almost without exception. Nevertheless the fact that yeast preparations in large amounts will produce a hæmopoietic response of variable degree in many patients with pernicious anæmia suggests that the impairment of secretion of intrinsic factor is often relative rather than absolute. Castle has observed the recrudescence of intrinsic factor in a patient who originally secreted free hydrochloric acid without intrinsic factor in the gastric juice.

"In a proportion of cases of Addisonian pernicious anæmia degenerative lesions are present in the brain, peripheral nerves and spinal cord, especially the latter. The incidence of subacute combined degeneration bears no relation to the severity of the blood dyscrasia, and may occur without anæmia. Relapses and remissions are frequent in pernicious anæmia, but in the absence of treatment the spinal cord condition is progressive. For amelioration of the neurological condition much larger doses of potent material may be required than are necessary to bring about a remission of the anæmia. In a recent series of 31 cases treated intensively for many months with liver extract intramuscularly we found that the degree of neurological improvement showed little or no correlation with age, initial anæmia or final blood-counts, and depended less upon severity than upon duration. Eighteen patients with difficulty in walking for under one year improved, however severe the initial disability, whereas six long-standing cases with an average duration of five years showed little change. Paræsthesiæ, dysfunction of the hands, sphincter disorders, mental disturbances, inco-ordination and impaired joint sense improved fairly consistently; impaired vibration sense and hypoæsthesia less so. Absent knee- and ankle-jerks often returned; increased jerks altered less frequently. Extensor plantar responses became flexor in six instances. Many patients who before treatment were completely bedridden and unable to stand regained more or less completely their ability to walk.

"It is probable that subacute combined degeneration like pernicious anæmia itself is the result of a nutritional deficiency conditioned by a gastric defect. The substance necessary for the nutrition of the nervous system is possibly distinct from the hæmopoietic principle, arising in a similar way from the interaction of two factors, extrinsic and intrinsic. An investigation of the dietaries of cases of pernicious anæmia has shown no differences between those with and those without spinal cord degeneration. On the other hand, there are certain facts which suggest that there is an intrinsic difference and that the gastric juice in cases of subacute combined degeneration lacks a factor distinct from "hæmopoietin" and for which Hurst suggests the name "neuropoietin."

"In Addisonian pernicious anæmia, where defect in gastric secretion is marked, the incidence of subacute combined degeneration reaches 30 to 40 per cent. In pernicious anæmia associated with polyposis of the stomach the incidence may be even higher. In marked contrast in this respect are the tropical macrocytic anæmias and those macrocytic hyperchromic anæmias occurring in sprue, cœliac disease and pregnancy, in which factors other than gastric defect (for example, deficient diet, poor absorption, demands of the fœtus) are largely responsible for the deficiency of hæmopoietic principle. In these cases free hydrochloric acid is often present in the gastric juice, the response to extrinsic factor alone (as Marmite) is usually excellent, and subacute combined degeneration is extremely rare.

"It has been suggested that the lesions in the nervous system in pernicious anæmia are due to deficiency or poor utilisation of vitamin A (Mellanby), vitamin B_1 (Gildea, Kattwinkel and Castle) or iron (Sargant), but the results obtained therapeutically with these substances have been disappointing. There is no conclusive evidence that any material lacking the characteristic effect of liver upon hæmopoiesis in pernicious anæmia can arrest the progress or influence the course of subacute combined degeneration.

"The isolation of the hæmopoietic liver principle in a pure form would be an important step towards the solution of the problem. Up to the present, tests with liver extracts prepared in a variety of ways have failed to demonstrate any lack of parallelism between hæmopoietic potency and neurological effect. Should the highly-purified product prepared by the method of Dakin and West prove to be as effective in subacute combined degeneration as our preliminary observations would suggest, the hypothetical cord

factor, if not identical with the hæmopoietic liver principle, must at least be closely allied to it chemically."

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MALARIAL MOSQUITO RESEARCH

Mr. H. S. Leeson and Mr. J. D. Gillett, members of the staff of the Entomological Department of the London School of Hygiene and Tropical Medicine, are journeying to Southern Rhodesia to continue an investigation begun by the former into the life history of malarial mosquitoes. In a few months' time the school hopes to send out more workers to follow up the research on which Mr. Leeson is engaged.

"On behalf of the school it was announced," says *The Times*, "that the investigation would ultimately cover the whole of Central Africa from Southern Rhodesia to the Sudan. The aim in the first place was to scrutinise very carefully the two mosquitoes chiefly responsible for the carrying of malaria, to see if they were everywhere identical and were not sub-divided into races.

"Studies in Europe had shown the importance in the prevention of malaria of examining insects with microscopic care and separating into races what at first appeared to be a single species. They had shown that there were no fewer than six races of the same *Anopheles maculipennis*; that the breeding places and the habits of the various races were different; that some liked fresh water and some liked brackish water; that some liked warm water and some liked cold water and kept themselves to the north of Europe; that some slept at peace with all mankind during the winter, either in cold attics or in cattle sheds; while others were restive and haunted the homes of men, continued to feed during the winter, and were responsible for the spread of malaria in several parts of Europe, particularly in Holland.

"In Asia similar knowledge had led to great advances in the prevention of malaria. For example, if a dangerous mosquito liked sunshine it was sometimes possible to blot it out merely by growing a hedge or jungle over its breeding place and so excluding the sunlight. In other places minute chemical changes in the water had driven out dangerous species of mosquito and freed large populations from malaria, from which they had suffered for years.

"The research work in Africa ultimately aimed at working in the closest co-operation with agriculture and forestry. At present in many parts of Africa water remained in the swamps after heavy rains, and those became very malarial. Many of the swamps, the scientists believe, could be converted from dangerous areas into reservoirs which would assist the Africans to tide over the dry season and to grow crops they had never as yet grown, in spite of the fact that the crops would be irrigated by water impounded in the dangerous swamps."

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POSTING PATHOLOGICAL SPECIMENS

It has recently been pointed out by the Postmaster-General that the postal regulations in regard to the packing of pathological and bacteriological specimens have not been strictly observed, with consequent risk of infection to Post Office servants and contamination of the mails in the event of leakage of the contents of such packets. We therefore publish the following conditions of acceptance of such liquids or substances for transmission by post:—

Any such liquid or substance must be enclosed in a receptacle which is hermetically sealed or otherwise securely closed, the receptacle itself being placed in a strong wooden, leather, or metal case in such a way that it cannot move about and with a sufficient quantity of some absorbent material, such as sawdust or cotton-wool, so packed as to prevent the possibility of any leakage in the event of damage to the receptacle. The packet must be conspicuously marked "*Fragile, With Care*," and must bear also the words "*Pathological Specimen*." Any package of this kind found in the parcel post or any packet in the letter post which is not packed and marked in this way will be stopped and destroyed, with all its wrappings and enclosures. A further point is that any person who sends by post a specimen packed in any other way than is provided in these Regulations is liable to prosecution. Where receptacles are supplied, as is so frequently the case, by a laboratory or institute they should be submitted to the Postal Services Department of the General Post Office in London in order to ascertain whether they are regarded as complying with these regulations.

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HUSKLESS OATS

So many letters are reaching the National Institute of Agricultural Botany asking for information about huskless oats that Sir Rowland Biffen has prepared a brief account of them, which appears in *Nature*, February 29th. "These oats differ from our ordinary varieties in two important respects. The first is that the thin, paper-like husks surrounding the grain do not grip it tightly, with the result that, on threshing, the naked grains are set free just as those of wheat are. The second is that they have some six or seven grains in each spikelet instead of the usual two or three. These grains are loosely strung on a stalk sufficiently long for two or three to protrude and hang down well below the glumes. As the result of this exposure, considerable losses from shattering may be expected in unfavourable harvesting conditions. It is responsible, too, for giving the standing crop the appearance of being very high yielding. But this expectation is not realised on threshing any more than is the expectation that a barley with six rows of grain must out-crop one with two rows only. Most of the huskless oats now in existence come from China, where several distinct forms are in cultivation, but though these have been tried out in many countries during the past half century, their range of cultivation has not increased to any extent. Of late years experimenters have paid a great deal of attention to these Chinese oats. Apparently none of these experimenters, although it is an important part of a plant breeder's work to assess the agricultural value of the material he collects, has seen fit to recommend the general cultivation of huskless oats. One English firm of seedsmen, famous throughout the world for the cereal varieties which it has bred and distributed, has for the past forty years used strains of naked oats for crossing with many varieties of the ordinary cultivated oats. Two years ago the firm abandoned this work, having become convinced that the chances of obtaining any derivative of outstanding agricultural value were negligible."

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THE INVENTION OF THE STETHOSCOPE

"The appearance of the subject of physiology on the examinational horizon cannot fail to quicken the interest of younger pharmacists in the history of medicine," observes a writer in *The Pharmaceutical Journal*. "This is a subject in which the public also is interested, as shown

by the announcement in the daily press that the British Museum has newly acquired 'a first edition of Laënnec's book, printed in Paris in 1819, which set the treatment of heart and lungs on a new footing.' It may be that every pharmacist would not unhesitatingly be able to state who Laënnec was, but in the near future most qualified men will be able to say, in the words of the late Dr. J. F. Payne, that he was the inventor of one of 'the most important of all methods of medical research,' namely the use of the stethoscope. Sir William Osler said that the book referred to—'Traité de l'Ausculation Médiate et des maladies des poumons et du cœur'—is in the category of the eight or ten greatest contributions to the science of medicine. The heroism and devotion of René Théophile Hyacinthe Laënnec constitute one of the major romances of the history of medicine. He was born in 1781; published his epoch-making book at the age of 38, and died in poverty of consumption when 45 years old. How he came to devise the stethoscope was told by himself. He was attending a young stout woman whose heart sounds he could not hear clearly. He had observed some children in the courtyard of the Louvre playing with logs of wood—one lad was tapping a beam at one end, and at the other end was another youngster listening to the increased sound. Laënnec understood the significance of this, and on reaching his patient he took, to quote from Sir William Hale-White's translation, 'a sheaf of paper, rolled it into a very tight roll, one of which I placed over the præcordial region, whilst I put my ear to the other. I was both surprised and gratified at being able to hear the beating of the heart with much greater clearness and distinctness than I had ever done before by direct application of my ear.' To-day, the stethoscope, in one form or another, is the companion of the thermometer in the equipment of every medical practitioner."

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CATGUT AND TETANUS

The Lancet (February 15th) publishes the following annotation on the above subject:—

"Several cases have recently been reported in this country of tetanus following surgical operation in which catgut has been used as a ligature material, and the question has arisen whether the catgut may not have been the source of infection. The Therapeutic Substances Regulations of 1931 placed the commercial production of sterilised gut under expert control by the Ministry of Health, and since then the risk of non-sterile catgut reaching the hands of surgeons is lessened, if it has not been actually eliminated. An American investigation[1] has suggested that catgut, prepared by commercial firms in several countries of the world, is still often non-sterile. It seems fairly clear, however, that such British material as was used in this investigation dates from the period before the application of Government control. But this control only applies to catgut as it is offered for sale and not to gut prepared in hospitals or by surgeons for use in institutions or private work. From the recent discussion at the Royal Society of Medicine it is evident that grave risk is being run from the use of catgut prepared under inadequate control. The dry unsterilised gut, used as raw material by some of the smaller hospitals which prepare their own ligatures, teems with micro-organisms—anaerobes and aerobes with their spores—to deal with which demands efficient processes of sterilisation, scientific rather than traditional. As W. Bulloch showed in 1929 it is possible under ideal conditions of manufacture, with the use of heat and certain chemical substances, to prepare catgut which satisfies routine bacteriological investigation. Whether such material will still be proved sterile after it has been subjected to digestion in the tissues remains to be seen; but the clinical experience of hundreds of surgeons, in thousands of cases where standard commercial catgut has been used, suggests that the risk is extremely small. What has been done so successfully in some hospitals should be feasible in others, and the time has come when the sterility of every brand of catgut used by surgeons should be controlled by standardised investigation. It is urgently necessary that some cheap and efficient method of sterilisation should be placed in the hands of the smaller hospitals and private surgeons who sterilise their own catgut, which, if rigidly followed, would remove a risk which, if numerically small, is yet a very terrible one. Where catgut is employed, as it generally is, because it is absorbed by the tissues, obviously the interior of the catgut must be as sterile as the exterior; and digestion methods in the bacteriological laboratory afford the only means of checking this. When delayed absorption is the aim the surgeon should satisfy himself that the 20, 40, and 60-day catgut is really absorbed within a few days of the time specified on the containers."

[1] Clock, R. O.; *Surg., Gyn., and Obst.*, 1934, lix., 899.

Correspondence

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

All correspondence must bear the name and address of the contributor for publication.

The Editor does not hold himself responsible for the opinions of his correspondents.

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VETERINARY SERVICE, PRESENT AND FUTURE

To the Editor of The Veterinary Record

Sir,—Your correspondent Mr. Hugh Begg asks me to give the comparative figures of "whole-time veterinary officers of local authorities" and "other members, not local government officers," sitting on the Standing Committees of N.V.M.A. within recent years. Mr. Begg has stated that the whole-time veterinary officers of local authorities on these Committees have become a "remnant" of what they were, and that a conspiracy exists amongst general practitioners to "clear the decks" of them altogether. Having made these statements one would have thought Mr. Begg would have given his figures to prove them true. However, he has thrown the onus upon me, and at some little trouble I now give the figures for the four years 1932-3, to 1935-6 inclusive.

So that there may be no ambiguity, I give the figures of (1) whole-time officers, (2) general practitioners (3) others, which includes teachers, research, and officers of the Ministries:—

	Whole-time Officers.	*General Practitioners.*	*Others.*
Year 1932-3 ...	12	37	43
„ 1933-4 ...	14	42	34
„ 1934-5 ...	14	41	33
„ 1935-6 ...	13	39	37
Totals	53	159	147

Please note there were two vacancies on the Committees in 1934-5 and one in 1935-6, which

goes to show the difficulty which exists in getting men to serve on these committees. I leave it to Mr. Begg and to your readers to judge from these figures how far the process of "clearing the decks" has gone, and to note that the "remnants" are greater in number than they were four years ago, and practitioners fewer than the two previous years. I trust Mr. Begg will be reassured, and be able to believe that this "bogie" at least does not exist.

I heartily agree with Mr. Begg that all sections of the profession, in or out of the National Association, should combine in good will, and would like to assure him from my experience of the meetings of practitioners held recently in eight centres ranging from London to Stirling, that their one desire is to work in unison, and co-operation with the whole-time officers of local authorities. At the first meeting held in London, a resolution came spontaneously and unprompted from a practitioner "expressing the willingness of all practitioners to co-operate with the whole-time officers" and this resolution was passed at each of the eight meetings with enthusiasm, and not a single dissentient voice. Would that the two sections could now meet and conspire together to co-operate, and I would suggest that, as a preliminary step to this, the Society of Veterinary Officers might join the parent body.

Yours faithfully,
E. P. Edwards.

Mold,
North Wales.
March 7th, 1936.

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"UNORTHODOX" TREATMENT OF COLIC

To the Editor of The Veterinary Record

Sir,—In your issue of February 29th a correspondent says: "It is the function of age to object to new ideas that do not seem to accord with general experience—and sometimes just to object to new ideas."

Well, I must be getting old, because the report of the case of colic cited by Mr. J. Barker, of Nelson, in the Clinical Discussion at Manchester during the meeting of the Lancashire Veterinary Association certainly roused several objections in my mind. My temerity in voicing these is all the greater when two very able men with the wide experience of Mr. A. B. Mattinson and Mr. A. W. Noël Pillers apparently allowed the case to pass without comment.

The report states that after the usual purgatives had been tried on the pony, the practitioner then pumped a bucketful of soapy water into the rectum some four to seven feet up the bowel. After this, "he pumped air into the animal through the pipe with a view to removing to another site any undesirable matter there might be."

The bucketful of soapy water is logical for the object in view, but to force air into a bowel already painfully distended with gas and "undesirable matter," is surely rather unorthodox. The air was apparently to set up an anti-peristaltic movement, which could only result in increasing the impaction and pain higher up.

It appears to me that the pony's recovery was *in spite* of the treatment, rather than the *result* of the treatment.

Yours faithfully,
Russell Kelly.

"Borrowdale," Huyton,
Liverpool.
March 3rd, 1936.

During 1935, 2,380 sick or injured animals belonging to poor people received free veterinary treatment at the professionally staffed R.S.P.C.A. animal clinic, 19, Vine Lane, Newcastle. Operations were performed on 51 animals, and 82 were painlessly destroyed. Income for the year was £91 0s. 8d. and expenses £132 14s. 6d.

Diseases of Animals Acts

SUMMARY OF RETURNS

Period.	Anthrax.		Foot-and-Mouth Disease.		Parasitic§ Mange.		Sheep Scab.	Swine Fever.	
	Outbreaks confirmed.	Animals attacked.	Outbreaks confirmed.	Animals slaughtered as diseased or exposed to infection.	Outbreaks reported by the Local Authorities.	Animals attacked.	Outbreaks confirmed.	Outbreaks confirmed.	Swine slaughtered.
	No.	No.	No.	No.	No.	No.	No.	No.	No.
Period 16th to 29th Feb., 1936	24.	26	—	—	8	41	21	71	37
Corresponding period in									
1935	17	22	1	60	4	6	17	51	21
1934	23	23	—	—	8	16	34	53	22
1933	15	21	4	555	10	25	31	47	26
Total 1st January to 29th Feb., 1936	95	119	4	389	33	116	105	373	208
Corresponding period in									
1935	77	86	21	4,345	43	60	120	264	100
1934	85	85	—	—	54	92	245	291	157
1933	77	94	40	4,052	50	96	146	141	42

Note.—The figures for the current year are approximate only. § Excluding outbreaks in Army Horses.